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Uncovering the intersection between race and gender of the experiences of female engineers

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Submitted in partial fulfilment of the requirements for the degree Master of Social Science in Industrial Psychology, in the Discipline of Psychology, School of Applied Human Sciences in the College of Humanities and Social Sciences of the University of KwaZulu-Natal.

Declaration

I declare that this dissertation is my own work. All references, citations and ideas have been acknowledged by the original author. This study is submitted for the degree of Master of Social Science, Industrial Psychology Degree, University of KwaZulu-Natal. The work presented has not been submitted for any previous degree or examination in another University.

Signature:

A handwritten signature in black ink, appearing to be 'Tarryn Goose', with a stylized, cursive script.

Tarryn Goose

Date: 2 March 2018

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Abstract

The purpose of the current study is to examine the complexities that female engineers experience in a male dominated industry. These complexities are compounded further when the element of race is intertwined with their gender. A review of the current literature notes the influence that gendered constructions have on society and therefore, perpetuates into the choices that men and women have based on their gender, especially in terms of appropriate career choices. The research focuses on social constructionism and intersectionality as a theoretical framework. As the study aims to understand the experiences of the female engineers and how their race intersects with their gender, a qualitative analysis was conducted, as it was the most appropriate for the study. Hence, semi-structured interviews were conducted with nine employed female engineers from various companies and engineering sectors. The semi-structured interviews took place from May 2017 to June 2017. A thematic analysis was conducted on the interviews, which formed three focal themes, viz. Negotiating Multiple Identities; The Two Extremes and Proving Yourself.

The nature of the identities in which the participants narrate can be seen as an act of intersection of the various identities, which the participants acknowledged in their narratives. The various identities are viewed as manifestations that form from the social interactions in which the participants immerse themselves in. In addition, the women would note ‘subtle issues’ that would arise in the engineering workplace, which differentiated the women from the men, however, would not acknowledge the severity of the inequality that perpetuated from the differentiation. However, many of the women would acknowledge the positive experiences they have had as a female engineer and were therefore treated as an engineer and not a female engineer.

Key words: women, race, engineering, South Africa, intersectionality, Social Constructionism, thematic analysis, qualitative.

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Chapter One

Introduction

“Like not having children, choosing to be an engineer demands an explanation, if you are a woman. The reactions of outsiders are a constant reminder that being a woman engineer marks them out as unusual; it begs a remark.”

(Faulkner, 2009, p. 173).

Since the dawn of democracy, the South African government has implemented various policies, labour laws and legislations to empower women in organizations (Constitution of Republic of South Africa, 1996). Additionally, the South African government has stipulated in the National Development Plan of 2030 that South Africa aims to reduce gender inequality (National Planning Commission, 2012). However, despite the efforts made by the South African government, gender disparity is still evident in various industries, such as the engineering sector (ECSA, 2016). Based on the engineering registration statistics reported by the Engineering Council of South Africa (2016), men continue to outnumber women in all registration categories (professional and candidate Engineers). Similarly, racial disparity is also evident in the engineering registration statistics. Female candidate engineers are characterised by the following racial groups: Black African (41%); White (37%); Asian (18%) and Coloured (3%), however, Professional female engineers followed a differed order: White (58%); Black African (23%); Asian (17%) and Coloured (2%) (ECSA, 2017). These statistics demonstrate the prevalence of male domination in the engineering profession in contemporary society (Faulkner, 2009b).

Furthermore, a dearth of literature is found on female engineers in South Africa, as most studies conducted on engineering students and professionals have been conducted internationally (Ayre, Mills, & Gill, 2013; Bastalich, Franzway, Gill, Mills, & Sharp, 2007; Buse et al., 2013; Holth, 2014; Pardo, Calvet, Pons & Martinez, 2016). Eurocentric studies cannot attempt to understand the dynamics of all female engineers. Therefore, this study intends to highlight the lived experiences of female engineers of all racial groups and the impediments they may face in a male-dominated and racially dispersed industry. It will do this in the context of South Africa, which has often been overlooked in the literature.

In order to operationalise the National Development Plan of 2030 (National Planning Commission, 2012), empirical research is necessary to understand the prevailing issues that perpetuate gender inequality in various occupations. In this study, the experiences of female engineers are explored to uncover the narratives, discourses and lived experiences of female engineers and the manner in which they achieve professional growth in an industry that perpetuates gender inequality. It is fundamental that women of all races and engineering disciplines are studied to unravel the reasons why women are in the minority in the field of engineering. With that being noted, this study will contribute to the body of knowledge that attempts to address gender inequality in a male-dominated profession, such as engineering. Therefore, the focus of this study is to unpack the discourses and narratives of women engineers in order to understand their experiences in a male-dominated and racially dispersed field.

1.1 Historical Context

South Africa's history is characterised by inequality and injustice as a result of the Apartheid era. In order to overcome the painful history of discrimination and segregation, South Africa has introduced various legislations (e.g. Broad-Based Black Economic Empowerment Act;

Employment Equity Act; Labour Relations Act) to reduce inequalities amongst South Africans, in terms of racial and gender inequality (Constitution of Republic of South Africa, 1996). However, despite the efforts made to introduce legislations and policies, the effects of these inequalities and injustices that were experienced in the Apartheid era are still evident in current society, due to the discriminatory practices that took place during the Apartheid era (Buthelezi, Alexander, & Seabi, 2009; Digby, 2013; Fiske & Ladd, 2004; Hills, 2015; Reddy, 1994; Thobejane, 2013). These inequalities are perpetuated in the career choices that are available to South Africans in a post-Apartheid society, as the inequalities of the past have limited the career choices available to black and female South Africans, resulting in a lack of progression in the workforce (Buthelezi, et al., 2009; Lewis-Enright, Crafford, & Crous, 2009; Reddy, 1994). Dass-Brailsford (2005) asserts that the previously disadvantaged racial groups are still affected by socioeconomic challenges. Consequently, the youth's self-efficacy is negatively impacted, hence, hampering their career choices and development. It is therefore crucial that the historical context of South African is reflected upon, as these inequalities are perpetuated into the post-Apartheid society.

A crucial component of Apartheid was the Bantu Education Act of 1953, which aimed to dehumanise and hinder the education for Black African and other marginalised racial groups, as well as the female gender in South Africa (Thobejane, 2013; Mhlauli, Salani, & Mokotedi, 2015; Zungu, 1997). This was done to continue the legacy of white supremacy and domination (Thobejane, 2013; Mhlauli, Salani, & Mokotedi, 2015). Black Africans received poor quality education in order to impair them from entering the modern sector, guaranteeing a consistent supply of cheap labour, especially in the mining, agricultural and domestic service sectors (Fiske, & Ladd, 2004; Thobejane, 2013). The poor quality of education for Black Africans was a result of the National Government under-spending on Black students in urban townships. Moreover, the purpose of these policies was to perpetuate white supremacy by affording white

South Africans higher quality education than the other racial groups (Fiske, & Ladd, 2004; Buthelezi et al., 2009; Bonner, & Sengal, 1998; Thobejane, 2013).

Higher level science and maths, as well as advanced technical and vocational subjects were only made available to white South Africans, hence, disadvantaging other racial groups in the career choices available to them (Fiske & Ladd, 2004). Additionally, black Africans received minimal training in science and maths and more training in the social sciences (Fiske & Ladd, 2004; Reddy, 1994; Thobejane, 2013). This facilitated a cycle of uneducated Black Africans. White South Africans were granted the opportunity to have access to universities of a good quality, whereas, black South Africans were transferred to institutions with inferior instructors, facilities and courses (Thobejane, 2013; Mhlauli, Salani, & Mokotedi, 2015). Black Africans were underrepresented in universities and were disproportionately enrolled in Technikons (Fiske, & Ladd, 2004). Segregation within universities was also experienced as the universities made available to Africans were primarily located in rural locations (Fiske & Ladd, 2004; Thobejane, 2013). This demonstrates the low-quality mathematics and science education in the Apartheid era and the labour policies which encouraged Black Africans to semiskilled or unskilled jobs, resulting in a lack of career opportunities available in the science, technology and engineering industries (Fiske & Ladd, 2004; Mhlauli, Salani, & Mokotedi, 2015; Mujal-Leon, 1988; Thobejane, 2013).

Furthermore, a lack of interest in scientific training may also stem from the lack of employment opportunities for Black Africans (Fiske, & Ladd, 2004; UNESCO, 1967). Additionally, very little training took place in agriculture or engineering, despite the greatest need for African engineers (UNESCO, 1967). It was also challenging for Black Africans to pursue engineering careers due to the lack of courses available at African colleges and the impediments faced when attempting to study full-time at a University (Mhlauli, Salani, & Mokotedi, 2015; UNESCO,

1967), in addition, science faculty admissions at university were limited to Africans. White collar, skilled, technical, professional and administrative jobs were reserved for Whites, whereas the unskilled, menial jobs were occupied by Black Africans (Buthelezi et al., 2009; Gerber & Newman, 1980; UNESCO, 1967).

These Apartheid policies may have affected the career choices available to marginalised racial groups, as well as the female gender. Additionally, women experienced double marginalisation pertaining to their race and gender. Women were forced to be dependent on men, as well as are given jobs that are of an inferior status, whereas men are afforded the superior occupations, which includes managerial roles. Therefore, income and employment disparity continues to be prevalent in society (Hills, 2015). Additionally, due to the low quality of mathematics and science education in the Apartheid era, many Africans may not have had the opportunities to pursue engineering as a career. As many Africans received education in the social sciences and humanities sector, as opposed to the science and mathematical training, this may result in the underrepresentation of female engineers in current society (Buthelezi et al., 2009; Fiske & Ladd, 2004; Mhlauli, Salani, & Mokotedi, 2015; Thobejane, 2013; UNESCO, 1967). Furthermore, these effects are evident in contemporary South Africa, as rural young females continue to face impediments in obtaining an education in the post-Apartheid era. These impediments include the poorly resourced schools; the responsibility of domestic duties; the long distances to reach schools and the drop-out rates to head households in cases where family members are orphaned due to HIV-AIDS (Hills, 2015).

Despite the continuation of the inequalities in the post-Apartheid South Africa, there have been improvements since the dawn of democracy in South Africa which allows for previously disadvantaged groups, including women access to education and consequently, workplace opportunities. These legislations and policies include the Employment Equity Act 55 of 1998;

The Labour Relations Act 66 of 1995; The Broad-Based Black Economic Empower Act 53 of 2003; The Constitution of the Republic of South Africa of 1996 and the Preferential Procurement Framework Act 5 of 2000.

The Employment Equity Act 55 of 1998 was introduced to promote the constitutional right of equality and to exercise democracy; to eliminate unfair discrimination in employment; to redress the effects of discrimination; to achieve a diverse workforce and to promote economic employment (Employment Equity Act, 1998). The Labour Relations Act 66 of 1995 aims to reduce discrimination in the workplace as well as address past inequalities (Labour Relations Act, 1995). The Broad-Based Black Economic Empowerment Act (B-BBEE Act 53, 2003) has created more opportunities for the previously disadvantaged, including women. The Constitution of the Republic of South Africa of 1996 also upholds the equality of citizens in South Africa, as per sections 9 (1 – 5), which emphasises the equality of South African's and that an individual may not be discriminated directly or indirectly against due to their race, sex, gender, marital status, ethnic or social origin, colour, sexual orientation, age, disability, religion, conscience, belief, culture, language and birth.

These legislations have been introduced in order to achieve equality both in and out of the workplace. Furthermore, South Africa's National Development plan of 2030 aims to reduce inequality by the year 2030 (National Planning Commission, 2012). However, as noted various professions such as engineering are still represented in a manner that illustrates gender inequality, as demonstrated in the statistics of female engineers in South Africa. As the National Development Plan of 2030 is to increase diversity and empower women, this study will add to the body of knowledge that attempts to redress gender inequality in the engineering field.

1.2 Gendered Constructions of Women in Non-Traditional Occupations

Gottfredson (1981; 1996) states that at an early stage of an individual's life one begins to associate occupations with gender and therefore when an individual chooses a career, the congruency between the occupations and one's gender is a crucial deciding factor (Adachi, 2013). Therefore this limits many young adults in terms of the career choices available, due to the emphasis on occupations which are gender specific (Adachi, 2013; Glick, Wilk, & Perreault, 1995). Images of occupations are often associated with gender and therefore create a sex segregation in occupations. Prestigious occupations and high wages are often associated with masculinity. Similarly, female-dominated occupations require 'feminine' characteristics and male-dominated occupations require 'masculine' characteristics (Cejka & Eagly, 2015). Therefore, women who pursue male-dominated occupations are required to behave in a manner which may be considered unnatural to them as women, resulting in the women adopting aggressive and competitive characteristics in order to succeed in the workplace (Martin & Barnard, 2013).

As a result, very few women enter male dominated occupations, as a woman is not expected to partake in a male dominated occupation, much less excel in a man's job (Lemkau, 1979). Therefore, women entering what is known to be a masculine occupation is deemed as deviant to the norm (Long, 1989). In this way, a gendered organisation or occupation is formed. Acker (1990, p. 146) conceptualises gendered organizations by stating that, "advantage and disadvantage, exploitation and control, action and emotion, meaning and identity are patterned through and in terms of a distinction between male and female, masculine and feminine." Therefore, by stating that an organization is gendered implies that the organization is perpetuating gender differences, by defining and structuring the organizations in such a manner that it forms a distinction between masculinity and femininity (Male, Bush, & Murray, 2009).

Females entering male dominated occupations experience challenges which manifest from the traditional gender hierarchies and norms which are evident in society. These stereotypical role expectations are leaked into organizational policies in order to maintain women's stereotypical roles in society. These norms are also engrained in the organizational culture, preserving gender discrimination in organizations (Bobbitt-Zeher, 2011; Cha, 2013; Davey, 2008; Martin & Barnard, 2013; Prescott & Bogg, 2011). Additionally, there have been minimal changes in male dominated occupations to accommodate females as the masculine culture is still evident. Power dynamics are also evident in organizations as men possess more resources and power to maintain the discriminatory policies, practices and ideologies in an organization to perpetuate the distinction between genders (Damaske, 2011; Martin & Barnard, 2013; Mathur-Helm, 2006).

Despite the underrepresentation of females in a male dominated field, females that pursue occupations which are male dominated are likely to leave the field, as females tend to return to occupations that allow them to fulfil their primary caregiver role, due to the association of the caregiver role and the mother (Ashraf, 2007; Cha, 2013; Danziger & Eden, 2007; Frome, Alfeld, Eccles, & Barber, 2006; Martin & Barnard, 2013). As a result of women leaving organizations, the 'leaky pipeline' is created (Frome, Alfeld, Eccles, & Barber, 2006; Oakes, 1990). Therefore, many women enter traditionally female dominated occupations in order to fulfil their family and work responsibilities simultaneously as opposed to entering a male dominated occupation, which requires a primary focus of work responsibilities (Frome et al., 2006).

It is, therefore, crucial to question the manner in which these occupations have been constructed and maintained over time. Based on these gendered occupations, it is imperative to ask: What are the consequences for women occupying a stereotypically 'masculine' occupation, such as

engineering? What are the implications for women of varied races entering a profession which perpetuates gender inequality? Various theoretical viewpoints are available in order to investigate these concerns. The two theoretical viewpoints adopted in this study are Social Constructionism and Intersectionality to understand these dynamics.

Social Constructionism places emphasis on the way people describe, explain and perceive reality (Burr, 1995; Gergen, 1985). This is usually done through the language in which one uses, hence, language has a performative role when constructing reality (Burr & Dick, 2017; Gergen & Thatchenkery, 1996). Reality is circumstantial and is perceived differently based on the circumstances and the context, therefore it rejects the notion of objectivity (Burr & Dick, 2017). Emphasis is placed on the discourse in order to understand reality, however, discourse lies in productive power and can influence the manner in which an individual acts (Knights & Morgan, 1991; Speer, 2005). Therefore, those in power are able to set the norms and have authority over others (Burr & Dick, 2017). Foucault (1977) argues that these constructions are a function of power relations within society. Hence, those that are able to dominate other groups are part of the dominant group, as power is able to be transferred through them (Hoy, 1986). Furthermore, Foucault (1980) also postulates that power and resistance are inseparable, therefore, power cannot operate without resistance. The current study will examine the power dynamics which avail themselves in the female engineer's accounts of working in a stereotypically 'masculine' environment. Consequently, the implications of the female engineer's sense of identity will also be investigated, by allowing the female engineers the opportunity to narrate their lived experiences to describe their reality as a female in a masculinized profession.

Intersectionality highlights the emphasis of individuals comprising of multiple identities. These identities operate simultaneously, resulting in differed forms of marginalisation.

Intersectionality rejects the notion that individuals' identities operate on a single-axis framework, but rather postulates that individuals comprise of various identities resulting in oppression and marginalisation (Crenshaw, 1993). These identities include but are not limited to race; gender; age and sexual orientation. Intersectionality aims to understand how oppression is experienced in individuals based on these multiple identities operating simultaneously (ibid, 1993). Intersectionality is crucial in the "study of inequality, identity and power relations" (Cho, Crenshaw & McCall, cited in Rodriguez et al., 2016). Intersectionality allows for the various characteristics which constitute one's identity to be explored simultaneously. Therefore, the female engineers race and gender will be explored simultaneously to understand how these characteristics operate to shape the lived experiences.

The fundamental question in this study is how female engineers of varied races narrate their experiences of occupying a profession which is stereotypically 'masculine?' Are female engineers equal to their male counterparts or are there limitations? The crucial elements to be uncovered include: understanding the identities of female engineers of varied race categories; analysing the liberties and confinements that female engineers experience and the implications thereof. Therefore, an analysis of the impediments that female engineers experience will be undertaken; an understanding of the ways the women negotiate their identities in a male dominated workplace and lastly, the impact that these experiences have on their well-being, their varied identities and their role in society.

The social constructionist approach will allow for the female engineers to provide the narrative and to allow them a voice in how they have constructed their reality and the implications thereof. As the experiences of women of all racial groups in engineering are uncovered, it is then possible to analyse whether South Africa is developing to achieve their vision of racial and gender equality. A comparison can also be made to existing literature, which states that

women are currently isolated in the engineering workplace (Bastalich et al., 2007; Buse et al., 2013; Pardo et al., 2016). However, although the literature acknowledges challenges in the experiences of female engineers, many women continue to persist in the engineering field (Ayre et al., 2013). By reviewing the narratives of South African female engineers of various races, the study is able to analyse the challenges faced as well as the persistence of female engineers in South Africa.

1.3 Study Aim

The aim of the study is to provide narratives of women's lived experiences as female engineers of various races within various disciplines of engineering. The study will unpack how the constructs of race and gender shape and influence female engineers lived experiences in the engineering field and therefore inform their identity. This will be undertaken through the lens of social constructionism and intersectionality as the theoretical frameworks.

1.4 Research Questions

- 1) How do female engineers narrate their experiences of the engineering field?
- 2) What challenges do women face in a workplace that is male dominated?
- 3) How does gender and race shape the experiences of female engineers?
- 4) What are the implications of these experiences on the women's well-being and personal, relational, cultural and social identities?

1.5 Research Objectives

- 1) To uncover the experiences of female engineers in the engineering field

- 2) To determine challenges that female engineers experience in the engineering field
- 3) To understand how race and gender shapes the experiences of female engineers in the engineering field
- 4) To understand the implications of the experiences on the women's well-being and personal, relational, cultural and social identities

1.5 Demarcation of Chapters

The dissertation comprises of five chapters: Chapter One (Introduction); Chapter Two consists of two components; the first section is the empirical review of literature and the second section comprises of the theoretical view, namely social constructionism and intersectionality; Chapter Three (Methodology); Chapter Four (Results and Discussion) and Chapter Five (Conclusion, Recommendations and Limitations).

1.6. Conclusion

In summary, in contemporary society there still tends to be an underrepresentation of females in the engineering industry. This may have elucidated from the injustices of the Apartheid era, as there were many injustices that hindered females and Black Africans from pursuing such careers. However, various legislations have been implemented in order to overcome such injustices of the past. Additionally, there are gendered constructions pertaining to career choices, which may prevent females from pursuing engineering, as this may be considered a male-dominated field. Social constructionism and intersectionality are also briefly explained in relation to the current study and the applicability of the frameworks to the study. The study aims, research questions and objectives have also been highlighted.

Table 1: Demarcation and Chapter Summary

CHAPTER	CONTENT
Chapter 1: Introduction	The reader is provided with an overview of the historical context that has shaped many organizations in South Africa. The effects of the Apartheid era have been highlighted to suggest a plausible explanation for the underrepresentation of female and African female engineers. The gendered constructions of non-traditional occupations have been highlighted and the implications for females entering such occupations. The aims and research questions of the research study have also been underlined to the reader.
Chapter 2: Literature Review and Theoretical Framework	A review was conducted on international and local literature which aligned with the main themes of the study: the ideal worker; non-traditional occupations and the implications for women entering these non-traditional occupations. The two core theoretical frameworks are discussed which include, Social Constructionism and Intersectionality.
Chapter 3: Methodology	The research methodology is defined which include: Research Questions; Study Design; Sampling; Data Collection; Data Analysis; Ensuring Rigour and Ethical Considerations.
Chapter 4: Results and Discussion	A qualitative thematic analysis was conducted and presented, integrating a discussion pertaining to the current literature and theoretical frameworks.
Chapter 5: Conclusion, Recommendation and Limitations	The conclusion provides a summary of the empirical findings of the study in relation to the literature. Based on the findings, recommendations were made. Lastly, the limitations of the study were highlighted.

Chapter Two

Literature Review and Theoretical Framework

2.1 Introduction

This chapter consists of two empirical components, these include the literature review and the theoretical framework. Firstly, the literature review explores the literature surrounding gendered organizations and occupations, such as engineering, and the implications of traditional gendered roles for women, as these are still prevalent in the contemporary society. Secondly, the theoretical frameworks utilised in the study will be reviewed. These include the Social Constructionist and the Intersectionality paradigms. The assumptions and findings of the studies will be reviewed and included in the literature review. The final statements of the literature review will consist of the relevance of the literature to the study, as well as a summary of the epistemological approaches will be provided.

2.2 Literature Review

2.2.1 Historical Context of Labour in South Africa

During the Apartheid era, organizations were governed by discriminative legislation in order to maintain white supremacy. Within this strategy, women bore the brunt of gender discrimination. Therefore, females were granted inferior education, her identity often tied to the home and underrepresented in organizations. Additionally, many Black South African's career choices were limited due to the education system that was utilised during the Apartheid era, which may be a plausible explanation for the underrepresentation of Black female engineers in South Africa (Buthelezi et al., 2009; Fiske & Ladd, 2004).

However, the post-Apartheid constitution has introduced human rights which emphasise racial and gender equality as a constitutional right. Chapter One of the Constitution of the Republic

of South Africa (1996) postulates that South Africa is founded on the values of the elimination of racism and sexism.

Chapter Two, Section 9 (3) of the South African Constitution, states that, “The state may not unfairly discriminate directly or indirectly against anyone on one or more grounds, including race, gender, sex, pregnancy, marital status, ethnic or social origin, colour, sexual orientation, age, disability, religion, conscience, belief, culture, language and birth” (Constitution of Republic of South Africa, 1996, p. 8). Subsequently, the Constitution highlights that in Chapter Two, Section 9 (4), that, “No person may unfairly discriminate directly or indirectly against anyone on one or more grounds in terms of subsection (3). National legislation must be enacted to prevent or prohibit unfair discrimination” (Constitution of Republic of South Africa, 1996, p. 9). These Constitutional rights have been incorporated into the Employment Equity Act, 55 of 1998 as Chapter Two, Section 6 (1), states that, “No person may unfairly discriminate, directly or indirectly against an employee. In any employment policy or practice, on one or more grounds, including race, gender, sex, pregnancy, marital status, family responsibility, ethnic or social origin, colour, sexual orientation, age, disability, religion, HIV status, conscience, belief, political opinion, culture, language and birth” (Constitution of Republic of South Africa, 1996, p. 9).

Based on the aforementioned laws that have been put in place to eliminate the injustices of the past, gender or racial discrimination is unlawful. In line with this, various legislations and policies have also been introduced to eliminate the exclusion in the workplace. These laws include:

- The Labour Relations Act (LRA, No 66 of 1995);
- The Employment Equity Act (EEA, No 55 of 1998);
- The Basic Conditions of Employment Act (BCEA, No 75 of 1997); and

- The Broad-Based Black Economic Empowerment Act (B-BBEEA No 53 of 2003).

Additionally, initiatives have been developed locally and internationally to empower women in science, technology, engineering and mathematical careers. Many organizations and foundations have encouraged women to pursue science, technology, engineering and mathematics careers by providing bursaries to women (e.g. WISE; SAWISE; WomEng; Intel). These initiatives have been developed to encourage and retain female engineers by creating an awareness of the engineering industry, therefore, increasing the participation of female engineers, as well as providing a support structure and skills development programme for female engineers (WISE; SAWISE; WomEng).

Despite the efforts made by the government, initiatives and organizations, Mostert (2009) postulates that minimal change has occurred since the apartheid era pertaining to gender role expectations. Therefore, it is understandable that women are still largely underrepresented in organizations, elucidating the underrepresentation of women in the engineering industry (Lewis-Enright et al., 2009). Gender role expectations are still pertinent in society and therefore continues to be perpetuated in organizations (Foucault, 1980). This study places emphasis on equality and redressing the inequalities in gendered occupations, by exploring the narratives of female engineers of varied races and the strategies employed to overcome the power dynamic that is evident in the engineering profession.

2.2.2. Discourse Surrounding Females in the Organizational Context

The South African government, as well as many initiatives, have aimed to empower women and to minimise the marginalisation experienced in the workplace. However, despite these contributions, women continue to be outnumbered in the engineering sector (Engineering

Council of South Africa, 2016). Research conducted locally and internationally highlight the tensions that female engineers (as a minority group) experience in a male dominated industry.

2.2.2.1 'Ideal Worker'

Many changes have been made in the post-Apartheid and contemporary society, therefore, women are beginning to view work as a dominant focus in their lives (Haworth & Lewis, 2005). The dominant perception of the 'ideal worker' in society is someone who is able to enter a career after graduating, who then progresses upwards in an organization without interruptions. Hence, a significant devotion of time to an organization is made (William, 2000, cited in April, Dreyer & Blaas, 2007). However, these expectations have great implications for women who aspire to reach executive roles. Many women in South Africa are unable to adhere to the 'ideal worker' based on the dual roles that women play in society, as both a mother and a professional. Thus, the 'ideal worker' is usually conceptualised as a male, due to the employee having unlimited availability to dedicate to the organization, as well as is not having distractions such as familial commitments outside of work (Lewis-Enright et al., 2009; Munn & Greer, 2015; Watts, 2009). In South Africa, many women take breaks in their careers, usually occurring in the middle of their career to raise children, in which is the time when the 'ideal worker' is moving up the career ladder (April et al., 2007). Therefore, these societal norms are discriminatory towards South African women.

Contemporary society has experienced an increase in the number of working women (Delina & Raya Prabhakara, 2013; Grossman, 1981). However, traditional gender roles are still prevalent in contemporary society, in which women often have to perform the housework chores as opposed to men, despite working full time (Bianchi et al., 2000; Boye, 2009; Saunders, 2016). Despite legislations and the contemporary economy, employers still expect

employees to prioritise work over their familial responsibilities, which in traditional norms is perpetuating the masculinity of the ideal worker (Williams, 2000; Brumley, 2014). In dual-income homes, it has been asserted that the primary role for men is to pursue a career, whereas women are deemed the primary caregiver of the children and the home (Doucet, 2000; Windebank, 2001). Therefore, women are often excluded from managerial or supervisory roles and are usually allocated the secretarial duties (Brumley, 2014; Denis 2003; Freeman 2000). Additionally, Zietsmann and Naidoo (1997) have also stated in a study conducted in South Africa that employers prefer male employees, as female employees are required to take maternity leave, which incurs a cost to the company. Moreover, success is also often associated with masculine characteristics, which include assertiveness, the 'long working hours culture,' competitiveness and ambition (Maskell-Pretz & Hopkins, 1997; Palermo, 2004; Watts, 2009). Therefore, as women do not possess these characteristics they experience a lack of progression (Brumley, 2014). As a result, a 'glass ceiling' is experienced, limiting women from achieving success. The 'glass ceiling' refers to invisible barriers evident in organizations, obstructing the vertical mobility of women. Women reach a certain level in organizations, but experience impediments in progressing further due to the 'glass ceiling' (Baxter & Wright, 2000). Hence, women experience stagnations in their career advancement, based on being a woman, despite their qualifications and experience (Cotter, Hermsen, Ovadia, & Vanneman, 2001; Morrison, White, & Van Velsor, 1987).

As organizations are demanding overtime from their employees, this becomes challenging for women who perform dual responsibilities, restricting them from entering male dominated occupations and forcing them into lower paying, 'feminine jobs', due to the time availability constraints (Cha, 2013; Correll, Kelly, O' Connor, & Williams, 2014). It is, therefore, often very challenging for women to pursue an engineering career, as well as be the primary caregiver, creating implications for gender equity in the organization and society. This is due

to the social discourses perpetuating gender inequalities in society (ibid, 2014). Furthermore, women are seen as naturally weak and therefore require protection from men, consequently resulting in women remaining in sheltered domains and performing their socially constructed responsibilities such as “giving birth to children, raising them, caring for their husbands and doing housework” (Zengin-Arslan, 2002, p. 405). Subsequently, men are able to protect themselves and can, therefore, perform occupations that require physical strength (ibid, 2002).

Based on the dedication and commitment required for employees to advance in their careers, especially for females in male dominated environments, women have to negotiate their roles in order to advance their careers, creating additional stress for women (Ayre et al., 2013). As women are deemed the primary caregiver for both children as well as a disabled or ill adult (Saunders, 2016), it often results in women choosing careers that allow them to balance their family responsibilities as well as pursue a career (Cech, Rubineau, Silbey, & Seron, 2011). Additionally, married women need to synchronise three conflicting clocks. These are known as the career clock, their biological clock and their companion’s career clock (Sonnert, 1999). Young women also felt the need to plan their level of success before taking time off due to pregnancy to avoid the result of professional damage. This would usually result in the women requiring an urgent promotion in a highly competitive profession, resulting in the women working longer hours and requiring a level of good fortune to reach this level (Gill, Sharp, Mills, & Franzway, 2008).

A South African study conducted by Mamabolo, Langa and Kiguwa (2002) on student perceptions of motherhood with regards to career aspirations, reported that young educated women acknowledged that being a ‘good’ mother and pursuing a career is a concern. Therefore, female engineers may decide to pursue one at a time, alternatively, women may opt for part-time work in order to balance both identities. However, these have implications in terms of

career advancement (Jorgenson, 2002; Watts, 2009). These findings were congruent with Rowe and Crafford's (2003) study on women in the banking industry, as women were forced to make a choice between motherhood and a career. The assumption made is that women acknowledge that career progression may be a limitation of their role in their family and are, therefore, less interested in attaining a career. This is demonstrated in Zengin-Arslan's (2002) study on female engineers, as the women reported that long site visits are incompatible for married women, as they would have to leave their home and children alone.

Furthermore, Australian female engineers in Ayre et al's study (2013) were criticised due to the provisions that they had to make to ensure that their motherly responsibilities were also met. One of the common provisions required was women opting for part-time work. However, these women encountered criticism and negative remarks, which was an attempt to demonstrate their inadequacy and lack of commitment to their profession. Surprisingly, these remarks were not only made by men, but also by women that did not have children. Hence, the engineering culture, which expects long hours of commitment by their employees, is problematic for women who have family responsibilities. Therefore, these women are unable to conform to the culture of the organization, consequently affecting their acceptance in the organization. As a result, their commitment to the organization and their profession is undermined (Ayre et al., 2013; Watts, 2009). Studies have further found that using flexible practices in the workplace or taking leave has decreased wage growth (Coltrane, Miller, DeHaan, & Stewart, 2013; Glass, 2004), resulted in fewer promotions, lower performance appraisals (Judiesch & Lyness, 1999) and are perceived as less committed and motivated (Rogier & Padgett, 2004) than full-time employees with no interruptions in their careers (Correll et al., 2014). Furthermore, engineering firms in Palestine stated that although they were willing to hire female engineers, the majority preferred to hire males which may be due to women not having as much freedom to work on

sites or travel as the men do, due to their obstructive values and religious beliefs (Baytiyeh, 2013; Enhassi, Ihsen, & Hallaq, 2008; Enhassi & Liska, 2000).

Women trying to negotiate a balance between their roles to create a work life balance has been acknowledged as one of the major impediments South African working women face (Booyesen, 2007; Broadbridge, 2008; Mostert, 2010; Rowe & Crafford, 2003). It is therefore unsurprising that women who prioritise having a family in the future are less likely to pursue an engineering or science degree than those who are not as committed to having a family (Burge, 2006; Ware & Lee, 1998). Family flexible careers are available and women are aware of those careers, however, it has been proclaimed that engineering is not one of those professions (Frome et al., 2006). Hence, female engineers that persist in the engineering workplace are less likely to be married with children, whereas women who had left the profession were more likely to have children (Ayre et al., 2013; Bastalich et al., 2007; Buse et al., 2013; Jagacinski, 1987). Additionally, the support structures that women had in place would affect their persistence in the engineering field. Buse et al. (2013) noted in their study of female engineers, that three of the persistent engineers were married to stay-at-home fathers. Moreover, Jagacinski (1987) found that women engineers were more likely to be married to professionals, whereas, this was unlikely for the male engineers. A quantitative study conducted by Fouad et al. (2016) demonstrated that those who persisted in the field of engineering and those who left was based on a factor of support and understanding by their managers about their work and family roles, therefore the hypothesis of “women who leave engineering have experienced lower levels of social support than women who stay” (p. 82) was accepted.

Studies have emphasised the need for family-friendly policies, which will assist women in negotiating their work-life balance, as a result of the challenges faced by women when negotiating part time and flexible hours. These negotiations may explain their under-

representation in the field due to women requiring career breaks when becoming mothers (Bastalich et al., 2007; Donovan et al. 2005). However, although managing childcare is a common challenge for mothers who are also engineers, Mills et al. (2006) study reported that very few of the participants reported this as the primary reason for leaving the profession. Furthermore, part-time work and extended leave are a concern for females pertaining to their career progressions, as once females begin to balance their career and family roles, their male colleagues are devoting more time to work and taking advantage of the available career opportunities. Evidence has also been found that men who are fathers still devote more time to work. A possible reason for this could be either to compensate for the loss of income from the mother or to use work as a 'safe haven' (Figes, 1994; Watts, 2009).

Despite the need for an emphasis on family-friendly policies, the counterargument is that it can create a contradiction for women. This is because women are emphasising that they are equal to men and do not need special provisions, however, by placing an emphasis on family-friendly policies it reinforces the idea that women do indeed need special concessions to succeed in the field (Bastalich et al., 2007; Ranson, 2005). This may be due to women no longer being seen as 'one of the boys' which accentuates the differences between men and women which creates challenges for women to be accepted (Ranson, 2005). This was found in a study conducted by Watts (2009) on civil engineers, in which women were treated as equals to their male counterparts until they became pregnant. Therefore, the struggles that women are facing demonstrates the masculinity of the field and how the culture of the workplace is male-dominated (Jorgenson, 2002).

Anderson (2004) notes that certain organizational cultures along with the discourses that are entrenched in them will encourage gendered behaviour, which influences one's gendered identity. Certain contexts require gendered behaviour, in which individuals will adapt

themselves accordingly, for example the engineering environment requires the individuals to adapt accordingly to the masculinised environment (Bastalich et al., 2007; Faulkner, 2009). These behaviours become entrenched in specific norms and codes, which are then infiltrated into one's social identity (Bastalich et al., 2007). Additionally, power relationships are formed, as within gendered identities, particular behaviours may be considered more appropriate than others. Furthermore, if these behaviours deviate from the gendered norms, the behaviour may be considered problematic for others and therefore require discipline by those in power. Hence, women who deviate from the social norms are subjected to criticism and discipline by men. Furthermore, Bastalich et al., (2007) notes that those who do not conform to the culture of the engineering workplace (which is largely based on masculine norms that are inherent in the profession) are considered 'outsiders' and 'foreign'.

In addition, individuals possess varied identities which merge and diverge depending on the context. These include but are not limited to one's professional; personal; social and relational identity. As female engineers are often required to adapt to the gendered norms in which society subscribes to them, their personal identity is affected. This is especially true for female engineers as their personal identity is affected by their professional identity as an engineer (Anderson, 2004; Bastalich et al., 2007). As female engineers are required to adopt characteristics that are suitable for the context in which they are placed, which is the male-dominated environment, feminine characteristics are counterproductive, hence, women need to adopt characteristics which are considered masculine (Faulkner, 2009; Jorgenson, 2002; Maskell-Pretz & Hopkins, 1997). Dehing, Jochems, and Baartman (2013) define one's professional identity as the process of becoming a professional engineer. The authors further explain that there are two dimensions in the development of a professional engineer, these include: social and individual dimensions. The individual dimension can be likened with one's personal identity, as this dimension includes the 'feeling' of becoming an engineer, hence is

the commitment that one has to the organisation. Thus, for female engineers, their professional identity merges with their personal identity.

As a result of social constructions of the traditional roles for men and women, women choose careers that would be more appropriate based on their gendered identity. The perceived appropriate behaviour for women would be to be emotional, caring, a listener, sensible, people oriented and emphatic. However, men are subjected to behaviours that are self-centred, assertive and controlling (Fondas, 1997; Saavedra, Araújo, Taveira, & Vieira, 2014). Based on these gender-appropriate behaviours, women are often estranged to technology, science and engineering professions, as these are less emotional and deemed appropriate for men. This type of gendered thinking explains why the engineering field is male dominated, especially due to male's interests in the hard sciences (Schiebinger, 1999; Saavedra et al., 2014). Furthermore, women are believed to be inadequate in technical issues and good at social issues. Therefore, the gendered image of femininity is often not associated with technology and technical issues, deeming engineering inappropriate for women, as women are considered more people oriented rather than object-oriented (Lippa, 1998; Rosenberg-Kima, Ashby Plant, Doerr, & Baylor, 2010). This association between sexual imagery and occupations is known as 'gendering' of professional identities (Evetts, 1993). Robinson & McIlwee (1991) state that to be a competent engineer, one needs to possess the image of being aggressive, technically oriented and competitive, which are traits that are commonly found in men. Thus, to be an engineer, an individual should talk, look and act like an engineer, which is usually associated with the individual looking, acting and talking like a man. Additionally, the imagery of the engineering profession to the public is seen to be synonymous to that of a labourer, resulting in the incongruity between femininity and the engineering profession (Phipps, 2002). Hence, the 'dirty hands' stereotype is prevalent in society pertaining to the roles of an engineer. As a result of the masculine and 'dirty hands' imagery of the engineering profession, a segregation is

created between men and women, deeming engineering inappropriate for women, as it is a 'man's world' (Evetts, 1993; Newton, 1987; Phipps, 2002). Therefore, women entering the engineering profession are considered to be 'atypical' and hence, a deviation from the norm (Evetts, 1993).

Faulkner (2009b) postulates that women are highly visible in the engineering profession based on their gender, yet highly invisible as engineers, creating implications for women attempting to place themselves in the engineering workplace. In order to combat this, being an engineer requires one to 'do gender,' implying that one needs to conduct masculine behaviours in order to create a sense of belonging to the culture of the organization (Faulkner, 2009). As the engineering profession is dominated by men who make up the majority of individuals within the field, these men would play a role in shaping the culture of the organization (Ayre et al., 2013; Bastalich et al., 2007; Faulkner, 2009b; Fouad & Singh, 2011; Masket-Pretz & Hopkins, 1997; Powell, Dainty, & Bagilhole, 2011). As men usually value individualism and competition (which are not common values for women according to literature), this may result in women experiencing the environment to be additionally stressful, resulting in women feeling isolated (Gibson, & Espino 2016; Tang 2000; Wentling & Camacho, 2008). Furthermore, the competitive nature which constitutes the engineering environment reflects masculine traits such as detachment, self-reliance and independence, which may result in women experiencing anxiety and fear of loss of their femininity or rejection if these traits are not developed (Evetts, 1993; Seymour & Hewitt, 1994). This may suggest why women experience the engineering workplace as challenging as they struggle for acceptance and to feel included, leading to a hindrance for females (Ayre et al., 2013; Bastalich et al., 2007; Faulkner, 2009b; Fouad & Singh, 2011; Masket-Pretz & Hopkins, 1997; Powell, Dainty, & Bagilhole, 2011).

Female engineers enter the industry with preconceived prejudices and discouragements, resulting in women experiencing discontent with the environment and leaving the profession (Zengin-Arslan, 2002). Furthermore, as the environment is comprised of masculine characteristics, women acknowledged the competitive environment, and stated they felt ignored and unwelcome (Buse et al., 2013). Many female engineers that left the engineering profession, specified that the engineering climate and culture to be problematic (Ayre et al., 2013; Buse et al., 2013; Fouad & Singh, 2011; Johnson & Asce, 2013). Thus, the inclusiveness of the organisational culture may possibly have a bearing on the persistence of female engineers as an inclusive organisational culture could give women a sense of acceptance and career progression (Faulkner, 2009b). These prejudices and discriminatory behaviour impact women in the field of engineering, as women have to adapt their identities to master the profession and regulate their behaviour in order to fit into the expectations that others have of them (Zengin-Arslan, 2002).

Furthermore, Faulkner (2009b) notes that engineering is remarkably resistant to gender change in comparison with other occupations in many countries. Mather-Helm (2005) suggests that women experience difficulty in achieving senior positions based on the organizational culture, as it is not yet ready to accept women as professionals. This becomes a barrier to women in the workplace, as ideologies are encouraging women to pursue work in order to obtain independence and self-fulfilment (Naidoo & Jano, 2002), however, limitations may occur from the work environment to the extent of advancement the women may achieve.

2.2.2.2 Workplace Challenges

Numerous impediments have been identified in the engineering profession for female engineers. Gill et al.'s (2008) study on Australian female engineer's states that women in their

study have highlighted experiences of being excluded and treated differently in the workplace based on their gender. Women were reminded of their ‘femaleness,’ as men treated them differently and not as equal colleagues (Gill et al., 2008). Women are also often excluded from social events and discussions by their male colleagues, as a common ground cannot be established (ibid, 2008), resulting in limitations to the women’s career advancement (Morrison et al., 1987). As a result of the exclusion to social events, a mentoring network cannot also be established, as these mentoring and social activities usually take place during social situations outside of the workplace, such as the golf course (Maskell-Pretz & Hopkins, 1997). Furthermore, the existence of an ‘old boys network’ is considered a challenge for women, as it disadvantages women based on their identity, as women cannot easily place themselves in these groups, as the dominant discourses are about sporting events (Phipps, 2002; Schäfer, 2006).

A common challenge in a male dominated industry, such as engineering, is sexual harassment. Female engineers would often be discouraged due to the sexual harassment that was experienced in the profession (Johnson, 2013; Servon & Visser, 2011). Servon & Visser (2011) noted that 69% of their respondents experienced sexual harassment. These findings are congruent with other studies (Bastain, Lancaster, & Reyst, 1996; DeSouza & Solberg 2003; Illies, Hauserman, Schwochau, & Stibal, 2003), as these authors have noted that women that are in the minority in the workplace, or work in non-traditional occupations are exposed to greater amounts of sexual harassment and sexism (Saunders, 2016). Moreover, sexual harassment, unfair gender expectations, gaining acceptance of male colleagues and pornography were common amongst all female engineer interviewees in Bastalich et al’s (2007) study of female engineers. Women in the United States have stated experiences of not being awarded the same opportunities as their male counterparts, experiencing inequality with regards to remuneration, promotions and treatment in the engineering workplace. Therefore, based solely on their gender their competencies have not been acknowledged or rewarded

(Ayre et al., 2013; Bagilhole et al., 2007; Buse et al., 2013; Fouad & Singh, 2011). Servon & Visser (2011) also noted that female engineers experienced discrimination when undergoing performance appraisals. Moreover, due to the women's minority status, their needs and sensitivities were often overlooked, such as women having to use the men's lavatories, as well as the lunch rooms would be filled with posters of naked women (Ayre et al., 2013). Male engineers in the United States have reported that they have greater supervisory responsibility and salaries compared to women, however, in some cases these factors were also dependent on experience (Jagacinski, 1987; McAfee, 1974; Rossi, 1972; Vetter, 1981). Furthermore, men were also more satisfied with their career opportunities compared to women (Jagacinski, 1987).

These gendered norms and social constructions are not only a hindrance in the workplace, but also for girls choosing to pursue studies in engineering. Lent (2005) postulates that one's gender may influence career decisions due to the development of self-efficacy and outcomes expectations as a result of how an individual is socialised. Therefore, an individual will choose a career that is most appropriate for their gender as a result of the stigmas, stereotypes and role expectations regarding male and female dominated professions (Buse, 2013; Hackett & Betz, 1981). Romkey (2007) affirms that the perceived masculine imagery of engineering may have a negative effect on children and teenager's perceptions of women in engineering, therefore discouraging them in pursuing the field. School girls also often shy away from physical sciences in school, which is problematic as physical sciences and mathematics are a prerequisite in studying engineering at a University in South Africa (Jawitz & Case, 1998). One of the suggested reasons for girls not pursuing physical sciences at school may be due to the manner in which physical sciences are taught and portrayed at school (Kahle et al., 2000; Zietsman & Naidoo, 1997). Chikuvadze & Matswetu (2013) stated that teachers are discriminatory towards girls in science classes, along with the dominant perception that science can only be pursued by men, which may result in girls rejecting science careers. These social

constructions can restrict career interests and impact on the opportunities available for women (Buse et al., 2013; Lent, 2005). Additionally, girls at a young age underestimate their mathematic abilities, despite the fact that their performance is on par with boys from the same age group (Rosenberg-Kima et al., 2010).

Furthermore, the underrepresentation of females in science and engineering careers may be due to the lack of identification with these fields. According to Tietjen (2004) many women in the United States of America are unaware of what an engineering job entails, which can be a result of the lack of interaction with engineers on a daily basis. It is common for citizens to interact daily with dentists, doctors and other professionals, but rarely engineers, which therefore results in society not understanding the role of an engineer. Moreover, engineers are also rarely the topic of television movies and shows (Johnson, 2013). It has also been proposed that females will pursue a career in which value is seen, however, if there is a lack of understanding of the job it is challenging to see the value. Hersh (2000) also notes that the engineering profession can sometimes be viewed as destructive to the environment, which constitutes a negative reputation for the engineering field.

As certain gendered social constructions are prevalent in society, females deviating from these constructions are subjected to discrimination. When women choose a career that is considered masculine and is characterised by masculine traits, these women may experience marginalisation, discrimination and subjection (Saavedra et al., 2014). These subjections may be experienced from school up until their professional career, as women that pursue physical science and mathematics at school are more inclined to an engineering career, as these abilities are seen as ‘natural gifts’ (Gill et al., 2008). These women have to work harder to prove their abilities to their male counterparts. However, the driving factor to pursue engineering is highly influenced by the individual’s capabilities and enjoyment of mathematics and science, which

was found in several studies from a variety of countries (Baryeh, Obu, Lampety, & Baryeh, 1999; Buse et al., 2013; Evetts, 1993; Holth, 2014; Jorgenson, 2002). Females in Ghana stated that their curiosity towards the engineering profession was the main driving factor, followed by their mathematics and science abilities (Baryeh, Obu & Lampety, 2000). Another common influence for females pursuing an engineering career is family and role model influences as it has been found that women that pursued engineering were more likely to have a family member as an engineer, as well as a teacher or counsellor whom encouraged the women to pursue the field (Ambrose, Lazarus, & Nair, 1998; Baytiyeh, 2013; Buse et al., 2013; Evetts, 1993; Gill et al., 2008; Holth, 2014; Jagacinski, 1987; Pardo et al., 2016). Many women would be encouraged by their parents to pursue a field that they wanted to do, however, this was not always supported when choosing a career in engineering due to the stereotypes surrounding the field (Ambrose et al., 1998).

In South Africa, career influences differ across racial groups. White female students pursue an engineering career for the same reason as in the Western society, these influences are the natural abilities of mathematics and science, as well as a supportive family structure (Jawitz, Case, & Tshabalala, 2000). Whereas, Jawitz & Case (1998) stated that black female students pursued an engineering degree due to opportunities to serve the community and the ability to prove themselves in a white male-dominated field.

Females also experienced a denial of practical experience based on their gender and were therefore treated as observers rather than engineers, resulting in the women not acquiring the same practical experience and expertise as their male counterparts (Holth, 2014). As a result of the discrimination, women lacked confidence to use the tools, machinery and computers, despite the mathematical and science abilities they possessed, whereas the male students were more comfortable with the necessary machinery (Schreuders, Mannon, & Rutherford, 2009).

As women are perceived as technically incompetent, male students in Mexico had a tendency to support and care for the females, however, this may be due to the women lacking confidence as a result of an underestimation of their abilities and lack of exposure to the technical components (García Villa & González y González, 2014; Peterson, 2010; Powell et al., 2011). Moreover, the masculine imagery of engineering also affects women's external attractiveness, as women that pursued engineering were viewed as masculine and less attractive (García Villa & González y González, 2014). Pardo et al. (2016) notes that females experienced the structure of the universities in Spain to be problematic, as the facilities in universities would only accommodate men. Female toilet facilities were deficient in the classroom areas, resulting in the women locating toilet facilities in other areas such as the administration and secretarial departments.

The hindrances experienced by female engineering students are amplified for black women choosing to pursue a career in engineering. Black women in the United States are largely underrepresented in the enrolment and graduate rates as opposed to their white peers (Snyder, Tan & Hoffman, 2006; Gibson & Espino, 2016). The National Science Foundation (2009) reported that engineering student enrolment rates for white women in the United States were 10.9%, whereas, African American women comprised of 1.3% of students in engineering. Studies conducted by Smallwood (2002) and Solorzano, Ceja & Yosso (2000, as cited in Gibson & Espino, 2016), state that black women experience racism and sexism on college campuses, with negative gender and racial stereotypes as well as unspecified expectations being common. These racist ideologies stem from stereotypes such as 'the strong black woman' which implies that all black women are more resilient in the face of adversity (Gibson & Espino, 2016). However, this may not be the case for all black women and due to the underrepresentation of black women at colleges in the United States, many faculty staff are not equipped to notice the isolation and stress that black women are experiencing (Beauboeuf-

LaFontant, 2009; Gibson & Espino, 2016; Watt, 2003). Despite the impediments experienced by black female engineering students, black women perceived themselves as hard working, strong and team players. The black women in Gibson & Espino's (2016) study would also acknowledge that their presence created value to the decision making and planning process of the project in which they were working on. Positive attributes such as independence, strength and confidence would allow for black women to negotiate their identity in a white male-dominated hostile culture (Gibson & Espino, 2016). However, several black women also reported that it was frustrating to continuously prove oneself as competent, as a result of not being offered the same privileges as their white male counterparts (ibid, 2016). Seymour & Hewitt (1997) postulate that in the universities in the United States, white faculty members and students' perception of black women having lower abilities, is likely to affect the black women's self-confidence. Black women engineering students in the south east of the United States believed that the expectations were lower for them than the rest of the class, due to their race and gender. Men also demonstrated feelings of astonishment when black women proved their abilities in mathematics and science, over and above a friendly personality (Gibson & Espino, 2016). This, however, was a common theme amongst all women engineering students, nonetheless, it may be more challenging for black women (García Villa & González y González, 2014; Pardo et al., 2016). Additionally, black women felt the need to prove their abilities even more due to their racial grouping. Black women have experienced their engineering studies to be more complex, as black women are in the minority for both their race and gender, resulting in double marginalisation (Gibson & Espino, 2016). Students often experience a lack of acceptance when there is a difference in the environment, this is especially true for multi-racial students. White females can easily identify with their racial group, however, due to the lack of female engineers of colour, it is more complex for multi-racial

students and they are unable to easily identify themselves in a category (Gibson & Espino, 2016).

Baryeh et al. (2000) found that female engineering students that had attended a girls schools in Ghana felt at ease with their male colleagues after a few months. Most of the male engineering students in Ghana were cooperative and helpful towards the female engineering students, whilst a few others behaved in a stereotypical traditional manner. Therefore, female engineering students in Ghana perceived being treated as equals to their male counterparts. Likewise, female engineers in Turkey also noted the absence of discrimination during their university education, resulting in a similar experience to the Ghanaian students (Zengin-Arslan, 2002). However, discrimination can occur in more subtle forms, such as the gendered distribution of engineering and the disciplines thereof is a sign of discrimination in itself. The gendered distribution has an impact on who enters engineering and which discipline they pursue (Zengin-Arslan, 2002).

Furthermore, not only is engineering in its entirety perceived as masculine, but discourses have further segregated the disciplines of engineering, by labelling some as feminine and others as masculine. Disciplines which consist of more than 50% female students have been labelled 'feminine' (Zengin-Arslan, 2002). Therefore, by labelling the various disciplines as feminine and masculine, this does not imply that some disciplines are more suitable for females or that females naturally choose such a field. These preconceived ideas are internalised and in some instances, women choose a particular engineering discipline based on these gendered ideologies (Zengin-Arslan, 2002).

Mechanical, electrical, civil, electronics, metallurgical and petroleum engineering are perceived as masculine, whereas food, environmental and chemical engineering are portrayed

as feminine. Additionally, the following disciplines have been labelled as mixed sex: geological, computer, mining, nuclear energy, hydrogeological, aeronautical and geophysical. As each engineering discipline is characterised by certain demands which may be labelled as more 'feminine' or 'masculine' it is important to understand the current stereotypes and discourses available for each engineering discipline (Zengin-Arslan, 2002).

Industrial Engineering is stereotyped to be one of the 'easier' engineering disciplines to pursue at an undergraduate level (Brawner, Camacho, Lord, Long, & Ohland, 2012). Brawner et al. (2012) found that in their study at multiple universities, industrial engineering graduated more women than any other engineering discipline. Similarly, Zengin-Arslan (2002) stated that industrial engineering has a relatively high representation of women in Turkey, which may be due to industrial engineering being a combination of administrative practices and mechanical engineering.

Despite the discipline being perceived as easier, it was found that the curriculum is similar to that of any other engineering discipline. Brawner et al. (2012) found in their study of female undergraduate industrial engineering students (at various universities in Midfield) numerous themes developed which attracted females to major in industrial engineering. The themes that emerged were warmth; flexibility; efficiency; feminine and the vast career opportunities available. Additionally, a study conducted by the University of Oklahoma stated that industrial engineering is more feminine compared to the other disciplines, which may attract women. As the field is not as technical as the other engineering disciplines, this may result in the assumption that industrial engineering is easier. However, this results in Industrial Engineering being devalued within the engineering hierarchy (Brawner et al., 2012). By labelling the discipline as 'imaginary engineering' it suggests that engineering can be classified on a spectrum of hard to soft (Brawner et al., 2012). Similarly to industrial engineering, chemical

and environmental engineering are less likely to be associated with mechanical innovativeness, which may be a possible explanation for women's greatest incursions to these disciplines (Bastalich et al., 2007). Chemical engineering is comprised of a large amount of work to be done in a laboratory as opposed to a production department, which may be a reason why women are more inclined to pursue chemical engineering (Pardo et al., 2016). Zengin-Arslan (2002) also postulates a reason why women are inclined to chemical engineering, as laboratories are comfortable and clean for women and do not require physical strength. The discipline does not deviate from the traditional female roles of being in the kitchen, as the laboratory is compared to a kitchen in which one mixes solutions and materials.

Unlike industrial, chemical and environmental engineering, female civil and mechanical engineers experienced marginalisation in the field due to underrepresentation of females. Bastalich et al. (2007) noted in their study in Australia that a female civil engineer experienced a large amount of marginalisation when pursuing her studies, as she was one of two women in a class of 60 during her studies to pursue a career in civil engineering. Civil engineers play a crucial role in society as they are needed to creatively solve problems regarding infrastructure; global climate change impacts; natural resource depletion and access to clean water to name a few. However, despite their integral role in society, female civil engineers are largely underrepresented in the field, although there have been improvements since the 1970's (United States Bureau of Labour Statistics, 2012; Johnson, 2013), as Isaacs (2001) states the percentage of women engineers has never reached 10% in the United States. Schreuder et al. (2009) states that females are underrepresented in the field of mechanical engineering in the United States. Female students tend to have a lack of interest in mechanical engineering (Byars-Winston & Canetto, 2011; Fernando Piera, Plana, Cageao, Lopez, & Fernando Piera, 2013; Hill, Corbett, & Rose, 2010; Knight et al., 2012; Medina, 2004). Fernando Piera et al. (2013) postulate that mechanical engineering in Spain is largely associated with cars and motorcycles, whereas, only

a small percentage of mechanical engineers work in such an environment. Furthermore, mechanical engineering is inaccurately perceived to be a blue-collar profession, that it is a dangerous, hostile and a physically demanding profession. However, most mechanical engineers are office-bound and are therefore not associated with these negative perceptions (Fernando Piera et al., 2013; Medina, 2004). However, based on these assumptions and preconceived ideas, many women do not enter the mechanical engineering discipline (Fernando Piera et al., 2013). Interestingly, mechanical and civil engineering were born during the industrialisation era, which may explain the association to masculinity and the perception of it as a convenient choice for men.

As noted, female engineers tend to experience impediments in the engineering workplace, however, Ayre et al. (2013) state that many women continue to persist in the engineering profession, despite the challenges. As this is unexpected, many studies have attempted to find the relationship between the individual and their persistence in the engineering field by using conceptual and theoretical models (Buse et al., 2013; Cech et al., 2011).

The models found that persistence is related to characteristics found in the individual's personality, these include attitudes, behaviours, aspirations and the workplace culture. The models have shown that the cultural and individual contributing factors are facilitated by the female's experience in the engineering work environment resulting in various degrees of persistence in the workplace or career commitment (Ayre et al., 2013; Buse et al., 2013; Cech et al., 2011; Van Antwerp & Wilson, 2015).

Buse (2011) found that women who persisted in the engineering workplace demonstrated self-efficacy and confidence, which assisted the women in negotiating and handling the challenges in the engineering workplace (Ayre et al., 2013). Persistent engineers demonstrated self-

efficacy in relation to finding new assignments, being challenged by new products, projects and technologies, dealing with challenging work situations and undertaking tough technical problems. However, self-efficacy was developed over a period of time to manage uncomfortable or threatening situations (Buse et al., 2013). The factors that differentiate women who persist and those that leave are: those that are confident in engineering tasks, possess confidence in the ability to manage multiple life roles, and the ability to navigate the organisational culture (Fouad et al., 2011). Substantiating this, the women who left the profession stated that it was challenging to keep up with the engineering tasks, manage their work-life balance as well as deal with the organisational political challenges (Fouad, Singh, Cappaert, Chang, & Wan, 2016). Despite the challenges faced, many of the respondents in Ayre et al.'s (2013) study stated that being an engineer was enjoyable and that they enjoyed the challenge of the profession. Engineering is perceived as challenging and interesting which is what drew women to it (Bastalich et al., 2007).

The culture of the environment is key to the persistence of female engineers, as female engineers that are personally and professionally accepted and respected, are more likely to stay in the organization. Therefore, the women in Ayre et al.'s (2013) study felt included and respected by their male colleagues and clients, despite their numerical minority in the organization. It has also been found in various models that the stronger the women's feelings of personal fulfilment and belonging to the profession, the more likely they are to persist in the field (Ayre et al., 2013; Buse, 2011; Cech et al., 2011). A factor that is likely to increase the women's confidence and workplace satisfaction is receiving positive feedback from their managers (Ayre et al., 2013). Fouad et al. (2016) states that women who persisted in the field experiences differed in terms of workplace support, career progression and their managers understanding their dual role as a mother and as an engineer.

Gill et al. (2008) also postulates that women enjoy the competition against their male peers. Furthermore, almost half of the women in Bastalich et al.'s (2007) study of various engineering fields in Australia have acknowledged that they have experienced little to no difficulty regarding discrimination and adapting to the culture of the workplace. As women encounter both positive and negative experiences in the engineering workplace, it was found that the positive experiences would be compelling enough to overcome the negative experiences. It was also common for women to not notice the discrimination or to find it challenging, whereas other women that encountered challenges would ignore the discrimination or persist. It was also common for women to use these challenges as motivation to continue (Ambrose et al., 1998). Female engineers would often disregard their minority status by suppressing any acknowledgement of gender differentiation (Eisenhart & Finkel, 1998; Jorgenson, 2002). Gender bias is often overlooked by female engineers and they believe they do not experience any direct discrimination. Furthermore, discrimination that did take place would be blamed on personality characteristics such as ego, rather than being based on gender (Jorgenson, 2002). Jorgenson (2002) noted that the majority of female engineers studied would state that engineering is gender neutral, therefore genders experienced equal opportunities.

Fouad et al. (2016) found in a quantitative study that the difference between women that persisted in the engineering field and those who left was based on advancement opportunities which play a large role in women's persistence in the field. Men were also more likely to persist in the engineering field, whereas young women who are engineering graduates are more likely to consider moving across firms and locations, and so age also influences the female engineer's persistence in the field (Gill et al., 2008).

2.2.2.3 Strategies Employed by Women to Persist

Despite women's persistence in the engineering field, acknowledgement needs to be given to the challenges that women face in the engineering professions. Due to these impediments, women have adopted various strategies to overcome these challenges. As women often experience the challenge of being acknowledged in the engineering workplace, female engineers often felt the need to prove themselves, become more visible in the workplace, assert themselves or work harder than a man. Only once these have been done, does the female engineer gain respect from the organisation (Ayre et al., 2013). However, asserting oneself may portray a sense of dominance, which was found to intimidate men, which could then lead to additional challenges for the women (Palermo, 2004; Schaefer, 2006). Men have noted that women react to the environment in various ways, these include presenting themselves as overly confident in the field, for example, if comments were to arise, the women would laugh about it or ignore it. The latter have been noted to be more likely to succeed in the profession (Bastalich et al., 2007).

Bastalich, et al. (2007) conducted a study in the Australian engineering workplace and concluded that it may be beneficial for women to demonstrate some form of masculine traits to conform to the environment and thus cannot demonstrate any form of emotion or femininity as this may result in derogation and a hostile workplace. It was also found that women that naturally conformed to masculine traits did not believe that the engineering workplace was challenging. These women also preferred and enjoyed working with men. An important component of surviving in the engineering field is to be independent and confident regardless of the derogatory comments made by others. When challenged in the workplace, many women would become more determined. There is also a feeling among female engineers to prove oneself to be as good as a man. It was emphasised among female interviewees to not react when

being teased and challenged, despite the extreme levels. Women would ignore the sexism, or otherwise regard it as amusing. Women demonstrated masculine behaviours, such as being assertive and confrontational, in order to counter the sexism in the workplace. It is also important to not allow one's emotions to interfere with work, but to stick to the facts at hand and if women do not conform to the logical style, men would simply refuse to listen to them. Becoming one of the 'boys' is known to be an effective strategy. Other strategies include distancing themselves from the values and culture as well as challenging the hegemonic masculinity of the organisation (Jorgenson, 2002; Kvande, 1999). In addition, Gibson and Espino (2016) report on female engineering students having to adapt to the engineering environment by dressing in a masculine manner. As one of the participants were discriminated against if they did not subscribe to the masculine dress code, which included wearing make-up and tight clothing. Hence, the physical appearance of female engineers is also crucial to the acceptance of the culture of the organisation.

Becoming self-employed was a strategy chosen by a few women whom were well-established in their careers. Whereas, part-time work was a more practical strategy for participants to create a work-life balance. However, this was not a common option (Maskel-Prettz & Hopkins, 1997).

2.2.3 Relevance of the Literature to the Study

The labour relations and historical context of South Africa is relevant to the study as it emphasises the effects of the Apartheid policies on contemporary roles and identities of women and Black Africans in South Africa. This is especially the case as career choices were limited due to the Apartheid era and therefore may have affected the underrepresentation of female engineers. The literature provides the dynamic and contradictory experiences women

experience in contemporary society, as well as how the women negotiate their identities in contemporary society, especially in a masculinised work environment.

The literature review provided makes reference to the contemporary organisational practices pertaining to gender as well as how these gendered organisational practices create implications and challenges for women. Implicit in the literature is the traditional gender roles as well as the masculinised work environment of engineering. The literature also reveals the strategies that female engineers utilise in negotiating their identity with the masculinised identity of the engineering workplace. The persistence of various women in the engineering environment challenges the hegemonies prevalent in society. The extent of the strategies employed and the persistence of female engineers in a masculinised work environment is explored through the female participant's voice in this research.

Despite the thorough analysis of the literature, there tends to be a dearth of South African literature on female engineers, especially pertaining to race and gender. Therefore, this study aims to shed light on these topics by answering the questions of the experiences of all racial groups and the impediments they may face in a male-dominated and racially dispersed industry.

2.3 Theoretical Framework

2.3.1 Social Constructionism

The social constructionist paradigm is grounded on subjective truths, as opposed to an objective reality. Social constructionism accentuates the process of how individuals describe, explain or perceive their reality (Burr, 1995; Gergen, 1985). A person's reality emanates from their experiences and perspectives in society, however, it has been acknowledged that multiple perspectives exist resulting in several 'truths' (Burr, 1995; Freud, 1994). Furthermore, these

perspectives are social artefacts, therefore, are culturally and historically specific which manifests itself through the interactions between people (Gergen, 1985). As a result, knowledge is ever-changing due to perspectives changing (Gergen & Thatchenkery, 1996).

Social constructionism places substantial emphasis on language, as language gains meaning in social interactions (Gergen & Thatchenkery, 1996). Therefore, language does not depict an action but is instead an action in itself, resulting in language being performative role in constructing reality (Burr & Dick, 2017; Gergen & Thatchenkery, 1996). Furthermore, how the world is perceived is not an objective reflection of nature but is a product of how reality is produced through language, therefore the defining characteristics of nature are represented through language (Burr & Dick, 2017). It is not surprising then that, social constructionists have a preference for qualitative methods such as semi-structured and narrative interviews, diaries and other forms of discourse (Burr & Dick, 2017).

Social constructionists place large emphasis on discourse, which are a culturally significant set of ideas, used to understand reality (Speer, 2005). However, not every and all ideas are discourses as for social constructionists; the difference lies in its productive power. Therefore, ideas not only explain or describe reality but also influence how one acts (Knights & Morgan, 1991). Furthermore, power relations referring to the status that an individual or group has in society such as class, gender, occupation and so forth allows them to have authority over others, due to the power that these groups have in society, therefore, they are able to set the norms and standards in which the rest of the society need to adhere to. Social constructionists have also analysed the power of certain discourses in society which create subject positions and identities, which may be problematic for individuals that are implicated in them, such as females working in a highly-masculinized field such as engineering. There are certain roles in

which females need to adhere to and by entering an engineering field, these roles are not fulfilled (Burr & Dick, 2017).

The social constructionist paradigm opposes the fact that an individual's identity is innate. As the social constructionist paradigm focuses on the shifting of identities; it proposes that one's identity is not static, but is rather fluid and ever-changing (Burr, 1995). The motive for this is that one's identity is constructed by the interactions between society and the individual, which are constantly being transformed (Shotter & Gergen, 1989). Thus, one's identity is constantly being shaped by interactions, resulting in the identity needing to adapt to these changes. An individual's identity is transformed and shaped by their social roles in society (Gee, 2003).

The importance of social constructionism in this study is that the construct 'gender' is crucial, as the study is analysing the narratives of female engineers, whom have entered a profession that is recognized to be male-dominated. The concept 'gender' is socially constructed and therefore creates implications for women that do not ascribe to the norms of their stereotypical role expectations, based on their gender. Furthermore, the construct 'race' also has attached connotations, as it is also a social construct. Therefore, by the study analysing both race and gender as social constructs and the implications for women who do not ascribe to those connotations, various perspectives will be provided (Burr, 1995). Social constructionism is a valid paradigm to use in this specific study, as social constructionism focuses on one's personal experiences, thereby engaging in various experiences and narratives regarding the women's experiences in the engineering workplace. The paradigm focuses on subjective truths, in which the women engineers will be able to provide discourse on, as it is their own reality. Social constructionism is culturally and historically bound, resulting in differed narratives based on the women's experiences in the engineering field, which is a result of the social and historical background.

2.3.1.1. Gender

Gender is a social construct, in that one's identity is not fixed, but rather fluid. 'Gender' as a construct is commonly misunderstood as the construct 'sex.' Gender refers to the socially "produced differences between being feminine and masculine" (Holmes, 2007 p. 2), whereas "sex refers to the biological differences between men and women" (ibid, 2007 p. 2). The constructs of masculinity and femininity are not internalised through childhood socialisation, but are rather reconstructed via social interactions (Connell, 1987). Gender refers to the roles and responsibilities created by society that are assigned to men and women. As a result of the responsibilities and roles assigned to males and females, expectations are created regarding the aptitude, characters and behaviour of men and women. These gender roles and expectations are learned through one's family, society and cultures (UNESCO, 2003). Gender is performed through one's daily interactions and is therefore a socially constructed concept. West & Zimmermann (1987) have developed a construct of 'doing gender' as gender is not what one does, but how they act and behave, which manifests from social interactions. Gender is an important construct to consider in the study, as women are assigned responsibilities based on societal acceptance, however, it is not necessarily accurate. By viewing gender from this standpoint, there is an under emphasis on the institutional arrangements which construct gender relationships, therefore neglecting the political, economic and social advantages that current institutions award men. These institutions are developed by men and therefore possess the standpoint of men, directly disadvantaging women (Acker, 1992).

Exploring gender in the study is significant as women are often encouraged to pursue careers which are more suitable and gender appropriated. These include nursing, home science and teaching, which has resulted in women being under-represented in high level education occupations (Baryeh, Obu, & Lamptey, 2000). Gender plays an essential role in the study of

female engineers as Faulkner (2007) highlights that engineers are expected to be men, therefore female engineers are a deviation both professionally and personally (Holth, 2014). Furthermore, women are pressured to ascribe to traditional female social norms which emphasise relationships in place of career goals, as well as to choose a 'traditional' female career. It is believed that women do not need to support their family's financially and are therefore discouraged in investing in their career aspirations (Levinson, 1996). As a result, women neglect their academic aspirations to ascribe to their traditional feminine roles (Matyas, 1996). Moreover, the media plays a vital role as the media and books usually perpetuate images of engineers and scientists to be men, hence female engineers are perceived as 'atypical' (Gallagher & Pearson, 2000).

2.3.1.2 Race

Race is also a socially constructed concept which one can physically observe. This indicator may be "imagined or observed bodily features presumed to be evidence of ancestral links to a certain geographical region" (Hanslanger, 2000 p. 43). These refer to the biological characteristics of an individual, however, as race is socially constructed, it is also defined by social interactions. Therefore, how an individual is perceived in society defines an individual's racial group. Social constructions refer to society assigning characteristics to individuals who are classified in a certain racial group, this process is performed due to the socialisation and interaction processes that society is accustomed to. As result of such, racial stereotypes arise (Higginbotham & Anderson, 2006). Spickard (1992) postulates that multiracial individuals define race as a social construction. Therefore, race does not exist outside of the social world, and is not based on scientific or biological facts (Gaskins, 1999). Race as a social construction places emphasis on the individual's role in society with regards to shaping their experiences and opportunities. Many studies have disregarded the biological characteristics of an individual

in terms of defining racial categories (Goodman, 2000; Seekings, 2008; Zack, 1995). Shih, Bonam, Sanchez, & Peck (2007) state that individuals that interpret race as a social construct are more likely to believe that race is less informative about an individual's innate traits and characteristics and therefore, are more likely to identify less strongly with their racial identity. Furthermore, Shih et al. (2007) states that early experiences associated with race play a role in an individual's opinion and beliefs about race, therefore, their understanding of where racial differences come from.

Due to South Africa's past Apartheid ideology and the segregation of racial groups as well as current laws such as B-BBEE Act, South Africans still place emphasis on dividing themselves amongst their racial groups. Therefore, South African's social worlds are largely characterised by racial groups and many continue to have negative views of other racial groups (Seekings, 2008). However, the segregation of races is not only seen in South Africa, but also in Africa, the United States of America and Brazil to name a few (Seekings, 2008). Despite the movements to eliminate political, economic and social barriers for racial groups, society is still largely racialized according to Seekings (2008). Racial categorisation in terms of residences have largely remained unchanged since Apartheid (Seekings, 2008). According to Walker (2005), the previous apartheid ideology has decreased in individual's daily lives, however, has not been eliminated in society.

South Africa's past is characterised by the segregation of racial categories, where Black African citizens faced discrimination, while white citizens would be privileged economically in society. Better paid occupations and land were reserved for white citizens, which was further extended to better the education for white citizens. Furthermore, black citizens were restricted as to where they were allowed to work and live, which provided an advantage for white farmers as they were provided with black farmers without having to pay competitive wages (Seekings,

2008). During the 1970's and 1980's improvements began to occur in the labour market, educational systems and to remove other restrictions. However, the effects of Apartheid are that South Africans continue to view society in racialized terms. Furthermore, different racial groups define race differently, such as the white racial group will define race based on physical characteristics or descent, whereas, African and coloured South African's refer to 'culture' (Seekings, 2008).

Race is important to consider, especially in relation to South Africa's segregated and discriminatory history. Various racial groups will experience the engineering field differently and possibly more challenging. This factor is based on their historical and cultural background. Various races need to be explored in order to view how the different races narrate their experiences.

2.3.2 Intersectionality

Kimberle Crenshaw (1993) coined the concept 'intersectionality,' however, numerous scholars during that period had also drawn attention to the limitations of highlighting and isolating race or gender as the primary category of difference, identity or disadvantage (Cole, 2009; Collins, 1990; Hancock, 2007; Hurtado, 1989; Smith & Stewart, 1983). Crenshaw (1993) critiqued the emphasis on a single-axis framework for its emphasis on privileged members of inferior groups. The motive for Crenshaw's analysis was to address the marginalisation of black women in antidiscrimination laws as well as feminist and antiracist theory and politics (Carbado, Crenshaw, Mays, & Tomlinson, 2013). Based on Crenshaw's analysis, she stated that black women plaintiffs differed in experiences to others, as the women would sometimes experience discrimination similar to that of white women or otherwise black men, therefore black women would experience both racial and sexual discrimination. Additionally, these women would also

sometimes experience discrimination as Black Women, which constituted a different form of discrimination (Crenshaw, 1993). This therefore resulted in the analysis of how multiple social statuses may be experienced simultaneously, which led to the understanding of the limitations of using single-axis statuses such as gender or race, as these constructs function simultaneously in practice. However, intersectionality is not a theory of difference but rather a theory of oppression ("“We’re all just different!” How Intersectionality is Being Colonized by White People", 2017). Furthermore, intersectionality is central to the “study of inequality, identity and power relations” (Cho, Crenshaw & McCall, as cited in Rodriguez et al., 2016). Power relations arise as once these constructs are analysed collectively, differing forms of marginalisation may occur, as noted by Crenshaw’s study of black women. However, members of inferior social groups also possess advantaged identities, such as middle-class blacks or white women. Therefore, intersectionality does not only analyse the dimensions of inferior groups but also how privileged groups are understood (Cole, 2009). The intersectionality of these constructs shapes the experiences of the individual (Hooks, 1981; Spelman, 1988).

Intersectionality aims to create emancipation through social change. This is achieved by analysing the numerous manners in which social structures create and entrench marginalisation and power as well as draw attention to the way in which current paradigms produce knowledge which often function to normalise these dynamics (Carbado et al., 2013).

The social categories of race and gender are pivotal to study, as previously marginalised racial groups have not had the same experiences as white women. Intersectionality is important to this particular study, as women are marginalised in the engineering field, however, there is a possibility that double marginalisation may occur when the social construct ‘race’ intersects. (Rodriguez, Holvino, Fletcher, & Nkomo, 2016). The recognition of multiple social categories results in multiple forms of discrimination, as opposed to single axes of discrimination and

therefore acknowledges that individuals can be discriminated against on the basis of more than one social category (Kantola & Nousiasinen, 2009). The intersection of race and gender informs the experiences of an individual (Hooks, 1981; Spelman, 1988).

2.3.4 Theoretical Relevance to the Study

This study adopts the social constructionist view that women in the engineering profession have rejected the traditional gender roles prevalent in society, therefore, demonstrate agency by reacting and challenging the changing roles in the South African society. Due to the intersectional framework also being utilised, multiple identities which women constitute of are analysed. Therefore, the female engineers are not considered absolute, but their various identities inherent in them, such as race and gender are analysed. These multiple identities are investigated in a manner that provides the researcher with the knowledge of how these multiple identities intersect with each other to inform the experiences of the individual.

2.4. Conclusion

In summary, there are various legislations that have been implemented in South Africa post-Apartheid to overcome the injustices of the past. However, women remain outnumbered in the engineering industry and minimal change has taken place since the legislations have been implemented. Additionally, contemporary organisations still have the ‘ideal worker’ ideology which formulates hindrances for females to progress in male-dominated occupations such as engineering. These become more complex when females enter motherhood and are required to balance being an employee and a mother. Therefore, certain industries such as engineering favour male employees due to the commitment that males are able to provide, as opposed to women – creating a discriminatory environment. Females also experience workplace challenges when exposed to the engineering environment. These experiences are not only experienced in the

workplace but also when females pursue their studies in a male-dominated environment. These challenges become more prominent for Black women. However, these challenges are not experienced by all women and has been acknowledged that some women do not experience such hindrances, therefore, these experiences cannot be generalised to all women. However, certain characteristics and factors also play a role in female engineer's persistence in the industry. Lastly, there are various strategies that women employ in order to overcome the hindrances of the engineering environment. The two theoretical frameworks utilised in the current study have been discussed, which includes Social Constructionism and Intersectionality. Social Constructionism has been utilised as female engineers have rejected the common gendered discourse by entering into a male dominated field, therefore, the current study aims to understand the discourse surrounding female engineers. Due to the study focusing on the factors race and gender, intersectionality aims to understand how the two constructs merge and diverge in the experiences of female engineers.

Chapter Three

Methodology

3.1 Introduction

This chapter highlights the research questions utilised in the study and defines the research design that was most applicable to the study. Additionally, the relevant sample and sampling procedure was also outlined. The participants' demographics have been outlined and tabulated. Furthermore, the data collection procedure and data analysis methods have also been emphasised. Thereafter, the ethical considerations that were adhered to are also outlined.

3.2 Research Questions

- 1) How do female engineers narrate their experiences of the engineering field?
- 2) What challenges do women face in a workplace that is male dominated?
- 3) How does gender and race shape the experiences of female engineers?
- 4) What are the implications of these experiences on the women's well-being and personal, relational, cultural and social identities?

3.3 Research Design

A qualitative approach has been used in this research in order to uncover the “how” and “why” questions exploring how female engineers construct their identities in what is considered a masculine environment. This allows for an explanatory approach to be undertaken, as opposed to the descriptive manner inherent in quantitative research (Liedle, 2008). A qualitative approach was adopted for this study due to the nature of the study, as the study focuses on the lived experiences of female engineers (Neuman, 2011). Qualitative research is a means for exploring and understanding the meaning individuals or groups assign to a human or social

issue. The focus of qualitative research is the participant in their natural setting and how the participants make sense of their lived reality without negating the complexities in their lives (Creswell, 2009). Qualitative research allows for an interpretative approach, which permits the researcher to make sense and provide meaning of the female engineer's daily lives in a male-dominated environment (Denzin & Lincoln, 2003). It is relevant to this study as it aims to understand the female engineers' social and cultural circumstances in their everyday interactions, revealing complexities inherent in the women's lived experiences (Philip, 1998). As the nature of the study is qualitative, face to face interviews were conducted (Myers, 2009).

Aligned with the social constructionism paradigm, a constructivist approach was selected for this study. A constructivist approach argues that many constructions of reality are possible, due to the subjective nature of each participant's reality. These constructions are based on the participant's reality and therefore shaped by their social and historical background. The constructivist approach emphasises the subjectivity of the participant's nature, resulting in multiple realities. In addition, it focuses on hermeneutics and dialectics, as the hermeneutics aspect aims to depict the participants' constructions of their lived reality. Whereas, the dialectic aspect attempts to compare and contrast the participants and researcher's constructions in order to confront these constructions. This aims to produce an informed construction. Therefore, constructivism intends to reconstruct the reality that exists for the participants, rather than intending to control or predict reality (Guba, 1990).

As the study focuses on the narratives of female engineers of numerous racial categories, qualitative research will be conducted, as it aims to study the everyday lives of female engineers. Qualitative research allows for an interpretative approach, which permits the researcher to make sense and provide meaning of the female engineer's daily lives in a male-dominated environment (Denzin & Lincoln, 2003).

3.4. Population and Sampling Strategy

The sampling strategy that was selected was non-probability purposive sampling. Purposive sampling allows the researcher to select participants that will provide value to the study, therefore explicit variables were selected in order for the participants to provide the greatest value to the study. The explicit variables that were selected were gender (females), qualified engineers, various racial groups (Black African; Coloured; Indian and White), employed as an engineer for a minimum of 2 years; and above the age of 23 (Neuman, 2011). Purposive sampling allows the researcher to identify and select individuals that have the acquired knowledge and experience necessary for the study, therefore it was most applicable to the study as certain characteristics needed to be met (Cresswell, & Plano Clark, 2011). Furthermore, snowball sampling was used as the interviewees would refer the researcher to another possible participants who met the criteria (Palinkas, Horwitz, Green, Wisdom, Duan, & Hogwood, 2015).

3.4.1 Demographics of Participants

Table 2: Demographics of Participants

Participant	Race	Relationship Status	Children	Length of Career
Isabella	Coloured	Single	None	2 Years
Sumitha	Indian	Single	None	10 Years
Vanessa	White	Married	2 Children	15 Years
Anika	Indian	Single	None	12 Years
Elizabeth	White	Engaged	None	19 Years
Valerie	Black	Single	None	2 Years
Olivia	Black	Single	None	8 Years
Arianna	Indian	Single	None	13 Years
Emily	White	Single	None	10 Years

All the women in the study were currently employed as engineers. As the study focuses on female engineers of the four major racial categories in South Africa, the sample consisted of nine female engineers: 3 White female engineers; 3 Indian female engineers; 2 Black African female engineers and 1 Coloured female engineer. The female engineers were of varied age groups. The sample was also dispersed in terms of the engineering disciplines that the female engineers pursued. Married and non-married women were included in order to provide the study with varied experiences. Additionally, one participant had children which provides the study with a varied experience based on being a mother and an engineer.

3.4.2 Position of the Researcher

My position in the study is an outsider, however, the commonality between myself and the participants was that I identified as a woman. Therefore, I have similar worldviews and tensions as the female engineers. However, I am an outsider in that I have not experienced the patriarchal engineering environment. I am a 23-year-old Psychology graduate and therefore do not have

knowledge surrounding the technicalities of the engineering profession. I am also not married, nor do I have children. Therefore, when analysing the narrations of the female engineers of various ethnic and racial groups, critical reflection needed to take place. Additionally, during the interviews, I would paraphrase and summarise what the participant had said in order to clarify any discrepancies.

3.5 Data Collection and Procedure

In line with qualitative research, the study used in-depth semi-structured interviews to conduct the data collection. The method makes use of an interview schedule that directs the participants discussion around specific issues topics (Whitley, 2002). By using semi-structured interviews, a degree of flexibility is permitted, so that the researcher and participant can engage in narratives with a degree of flexibility, in which the researcher is able to probe important and interesting areas that the participants are able to generate light onto (Smith & Osborne, 2007). Furthermore, the participants are able to represent their reality and how they make sense of their reality, by providing narrations of their lived experiences (Smith & Osborne, 2007). The interview schedule is used as a guide rather than a set instrument that needs to be followed. Semi-structured interviews allow for the participants to provide their own subjective interpretation of their reality, which is important as it allows agency and a sense of control over their lives (Rappaport, 1990).

Individual face to face interviews were conducted with seven of the female engineers at various sites. One of the interviews was conducted via Skype; another telephonically, due to the location of the participant. The initial interviewees referred the researcher to other participants and if the criteria were met, those participants were interviewed. Each interview lasted

approximately an hour to an hour and a half. The interviews were conducted at a venue that was suitable for the participants, hence, varied venues were utilised.

3.6 Data Analysis Method

Interviews were initiated, recorded, transcribed verbatim and analysed through systematic procedures (Strauss & Corbin, 1990). These included research questions, participant responses and my experience in the interviews. The analysis of the data was guided by the four main research questions: (1) How do female engineers narrate their experiences of the engineering field? (2) What challenges do women face in a workplace that is male dominated? (3) How does gender and race shape the experiences of female engineers? (4) What are the implications of these experiences on the women's well-being and personal, relational, cultural and social identities? These questions provided a framework for the interview process.

Each interview was audio recorded digitally and transcribed verbatim by the researcher. The interview transcripts were read and coded for themes that were related to the research questions and the theoretical frameworks utilised.

Various data analysis techniques are available in qualitative research; however, the thematic analysis technique was adopted due to its alignment with the social constructionist paradigm. Thematic analysis is also often used in a realist or experiential method; however, it is also compatible with constructionist and essential paradigms in psychology. The reason thematic analysis is compatible with the social constructionist paradigm, and this study is that it examines the manner in which meanings, realities and experiences are a result of the discourses that are prevalent in society (Braun & Clark, 2006). Additionally, "through its theoretical freedom, thematic analysis provides a flexible and useful research tool, which can potentially provide a rich and detailed, yet complex, account of data" (Braun & Clark, 2006, p. 78).

Thematic analysis is a method that identifies, analyses and reports patterns, also known as themes in the data. Therefore, it entails describing the data in detail, as themes emerge from the data. Thematic analysis is applicable to various theoretical frameworks, and is therefore, not restricted to one specific theoretical framework as opposed to the other data analysis methods (IPA or grounded theory), allowing the analysis method to coincide with the social constructionist paradigm (Braun & Clark, 2006).

In order to perform a thematic analysis, the voice recordings need to be transferred into a verbatim written form, such as a transcript. The transcription of the voice recordings allowed the researcher to immerse themselves in the data before the analysis began, as a more thorough understanding was formed of the data (Braun & Clark, 2006).

Braun & Clark (2006) state that there are six steps or phases when analysing data using a thematic analysis.

Phase 1: Familiarising yourself with the data: this phase allowed for the researcher to immerse themselves in the data in order to understand the depth of the content. Therefore, the transcripts were read repeatedly in order to find meanings and patterns.

Phase 2: Generating Initial Codes: once the familiarisation of the data and a list of initial ideas are formed, the production of initial codes took place. Therefore, the data was organised into meaningful groups and codes which are relevant to the research question (Braun & Clark, 2006; Tuckett, 2005). However, it must be noted that, this organisation phase is different to the generation of themes phase.

Phase 3: Searching for Themes: once a list has been generated of different codes, this phase involved analysing the data for broader themes, therefore, sorting the codes into potential

themes and placing the relevant extracts or data in each theme. During this stage, the coded data was placed into broader themes and sub-themes, as well as various codes were discarded due to the inapplicability to the study.

Phase 4: Reviewing Themes: based on the themes established in phase 3, the themes were refined, which involves discarding themes or merging themes into one. A pattern needed to be formed here in which the extracts collate with the themes, therefore, some themes were refined in order to create a more suitable theme for the data. The data was re-read in order to ensure that all data has been coded correctly and to ensure that no additional data has been missed.

Phase 5: Defining and Naming themes: this phase involved understanding what each theme meant and which aspect of the data the theme captures. Therefore, a detailed analysis is implemented in which a story is formed regarding each theme. Sub-themes are also established during this stage. The themes and sub-themes were given appropriate names in relation to the data.

Phase 6: Producing the Report: this phase allowed the researcher to relay the data to the reader in an interesting and coherent manner and in relation to the research questions.

3.7. Ensuring Rigour

Due to the complexity of qualitative research it is pertinent to the quality of the research that rigour is ensured throughout the research process. However, as qualitative research is largely subjective and is based on the narratives of the participants, ensuring rigour is more complex in qualitative research than in quantitative research. Quantitative researchers rely on numbers and statistics to determine the rigour of the research, which is not applicable to qualitative research (Cypress, 2017). Establishing rigour ensures that the research is both valid and

reliable, however, relating to qualitative research. Therefore, the quantitative measures to provide validity and reliability cannot be applied to qualitative research and need to be tailored to the research design. Despite the complexity of ensuring rigour in the qualitative research, in order to prove the quality of the research, rigour should be ensured throughout the entire research process, these are usually proven using four elements, which include: credibility, transferability, dependability and confirmability (Cypress, 2017).

Credibility: Credibility refers to the interpretation of the data and whether the researcher has interpreted the participants narratives and views correctly, subsequently depicting an accurate portrait of the participants perspective and narrative (Anney, 2014). There are various strategies that can be utilised to determine the credibility of the research. The form of credibility that was used in the current research was triangulation. Triangulation has been used to determine the credibility of the research, as the researcher used multiple methods to formulate diverse perspectives. This method is used to reduce researcher bias. The manner which triangulation was used in the current research is that the researcher made use of a variety of participants from various workplaces, industries etc. The participants were also from diverse backgrounds, age groups and racial groups. By making use of a variety of participants, diverse perspectives were uncovered, hence, reducing the bias of the researcher (Anney, 2014; Shenton, 2004). Triangulation was also used as various sites were also used for the interviews, therefore, various organisations were utilised, providing a diverse basis for perspectives (Shenton, 2004).

Transferability: Transferability refers to the extent in which the research results can be transferred to a different context (Bitsch, 2005; Tobin & Begley, 2004; Anney, 2014). By utilising purposive sampling, the research results are able to be transferred to a different context, as the sample group has been chosen based on answering specific research questions, based on a specific purpose. By using purposive sampling, the researcher is able to gain

knowledge that is specific to the research topic from participants that are knowledgeable about the topic. Therefore, female engineers were selected in the sample, that had at least two years' experience as an engineer. The female engineers were chosen for a specific purpose and therefore, when using the same sample, the research should yield the same results if transferred to a different setting (Anney, 2014).

Dependability: Dependability can be likened to the term 'reliability' in quantitative research. Hence, can be noted as the reliability and consistency of the research findings (Moon, Brewer, Januchowski-Hartley, Adams, & Blackman, 2016). The recordings of the participants interviews were initially listened to, to form the interview setting again. Once all the recordings were replayed, the transcription phase began. The recordings were then compared to the transcriptions to determine if there were any missing ques, which helped the researcher to replay the initial interview with the participant in the researcher's mind. This essentially assisted in the analysis phase, as the researcher had a clear understanding of the interview process and had highlighted any factors that were missed during the collection of the data. A table was also formulated highlighting the codes of the analysis, which assisted the researcher in linking any themes that emerged from the data. This allowed the researcher to easily analyse the different narratives across all the participants and to highlight any themes. These themes were reviewed to determine the applicability to the research questions and topics (Krefting, 1991).

Confirmability: Confirmability refers to how the conclusions can be derived from the results. Therefore, a process can easily be followed to determine how the researcher derived the conclusion (Moon, Brewer, Januchowski-Hartley, Adams, & Blackman, 2016). The manner which confirmability was achieved was by keeping a research journal. This allowed the researcher to be self-reflexive throughout the process and to eliminate any biases. After each

interview researcher notes were made during the interview, which were incorporated into the analysis of the findings. This can be likened to an ‘audit trail’ in which the interview recordings were transcribed, as well as additional notes were made on the interview process, eliminating any researcher bias.

3.8. Ethical Considerations

The Higher Degrees Committee of the Faculty of Humanities, Development and Social Sciences at the University of KwaZulu-Natal granted the researcher permission to conduct the study, as an ethical approval was secured from the Ethics Committee of UKZN (HSS/0395/017M) (Appendix B). Each participant was approached individually for their permission to participate in the study. Each participant approved their participation by signing an informed consent form (Appendix C and D).

At the outset of each interview, the aims and objectives of the study were relayed to each participant. Participants were also fully aware of their right to withdraw from the study at any stage if they felt the need to. As the form of data collection was interviews, the anonymity of each participant was guaranteed. Confidentiality was guaranteed to all participants, each participant was informed that their responses will be used but their names would be changed into pseudonyms, in order to protect their identity. Participants were interviewed at their convenience, at time and place that would be most suitable for the participant.

3.9. Conclusion

The methodology adopted in the current study is qualitative research, as the researcher attempts to understand the lived experiences of female engineers and how their race and gender intersect and the impact of such on their experiences. The Methodology chapter explains the use of a qualitative design as well as justifies the applicability of qualitative research for the current

study. The sample has also been discussed and justified per the current study, as purposive sampling was used due to the applicability to the study. Semi-structured interviews were used as the method is flexible to provide rich data. When analysing the data, the researcher used a Thematic Analysis data analysis method, as it was the most appropriate to the current study. The manner in which rigour has been ensured was explained, as well as the ethical considerations for the current study.

Chapter Four

Results and Discussion

4.1. Introduction

The findings of the research were categorised into three fundamental themes. The first theme includes the negotiation of the *Intersection of Multiple Identities*. This theme uncovers how the female engineers negotiate the intersection of the multiple identities in which they possess, which include a: Negotiating a Personal and Professional Identity; Social, Relational and Professional Identity; Deconstructing Race and Gender; The Role of Motherhood; and lastly, the implications of the engineering environment to the female's well-being. The second fundamental theme, *Mediating the Two Extremes*, uncovers the participants narratives in relation to the two extremes in which are experienced in the engineering workplace, the two extremes include, 'standing out as female' and 'one of the boys.' The participants' narratives and experience of the two extremes are analysed and uncovered. As the two extremes contradict each other, these will be analysed in accordance to the female engineer's experience. The last theme, *Proving Yourself* uncovers the varied narratives of proving yourself as a female engineer, and proving yourself as an engineer. The final part of the chapter includes a summary of the results found in the participants narratives.

4.2 Negotiating the Intersection of Multiple Identities

The female engineers narrated their various identities, however, these identities are not unified, but rather intercept with one another to form complexities and varied experiences in the females lives. Hence, the women do not only possess the identity of being a female, but also other varied identities which impact on their experiences as a female engineer. The female engineers commented on the role of their professional identity intersecting with their other identities,

which include their social, relational, personal and cultural identities. The female engineers also commented on the implications of their professional identity on their well-being.

4.2.1 Negotiating a Personal and Professional Identity

A pattern was formulated amongst the participants narratives in which their personal identity would inform their professional identity and vice versa. A common theme emerged amongst the female engineer's narratives, which illustrated how the female engineers would have to find means to allow for the engineering environment to be effective for them. A few of the women would report that they would need to find ways to adapt to the environment, as a means to survive and thrive in the engineering sector. This indicates that there are characteristics or strategies needed to be adopted to succeed. In addition, five of the participants evaluated the impact of the engineering environment on their personal identity, as they proclaimed that the environment has '*toughened*' and '*created a thicker skin for them.*' Therefore, illustrating the influence of their professional identity on their personal identity. This was illustrated in Olivia's narrative, in which she comments on the enabling characteristics to succeed:

"...its male dominated but I would encourage females to go into it, there's actually nothing, there's no disadvantages being a female in there, in fact I think it makes you stronger. Ya, it makes you stronger, more resilient and you can survive at any time, I mean if you can be the only female all the time and hardly notice it anymore, and be just as strong as the guys, ya it definitely makes you stronger. But I would also say it's not for everybody, like for females, you need to be tough, to go in there."

This was further illustrated by two other participants:

Arianna: *"...it takes a bit of getting used to and uh, like you have to get a bigger, thicker skin..."*

Valerie: *“So it really has created that thick skin sort of you know what its fine, I’ll do it, I’m no longer emotional about it.”*

Interestingly, Arianna notes that the engineering environment requires her to adapt, however, she asserts in her narrative that being an engineer has not affected her personal life or changed the way she is outside of the engineering industry.

As noted in the above excerpts, female engineers are often required to adopt certain characteristics to enable them to survive and thrive in the engineering environment, as a result of the highly masculinised culture. These characteristics are usually associated with males; and so, the women would adopt masculine characteristics. This can be likened to Palermo’s (2004) study, as she reports on the incompatibility of the women’s sex role characteristics in managerial positions. She illustrates that these roles are infiltrated by stereotypically masculine characteristics, which include independence, aggression and dominance. As a result, women are assigned job roles that are compatible with their feminine characteristics and are therefore unsuitable for managerial positions. Hence, as illustrated by the participants, women would need to adopt and learn these masculine characteristics in order to conform to the engineering environment. This is amplified in Bastalich et al.’s (2007) study, as the authors note how those that do not conform to the masculine norms, are considered ‘foreign’ and ‘outsiders.’

In addition, two participants have also made reference to being ‘*forceful*’ and ‘*assertive*’ in the engineering industry, which illustrates that these ‘masculine’ characteristics should be acquired in the engineering industry:

Emily: *“... again, it’s a case of you have to learn to be forceful...”*

Valerie: “...No it is but you really have to be assertive, it has been but it’s also made me grow as a person in terms of asserting myself...”

As women are in the minority in the engineering sector, it is unsurprising that the engineering environment enforces ‘masculine’ characteristics, which women learn and adopt in order to ‘fit in’ with the culture. This is affirmed by Faulkner (2009) as she postulates that the largest group will determine the culture of the organisation, hence, as the engineering industry is male-dominated, these men seem to dictate the culture of the organisation. As a result, the group that is in the minority is required to adapt and to ‘fit in’ to the predetermined culture in order to create a sense of belonging.

Furthermore, Valerie elaborates on having to adopt the ‘assertiveness’ characteristic as a Black African female, as she notes that the ‘masculine’ characteristics need to be pronounced further. Valerie notes that being a female is challenging on its own, however, being a black female adds another dimension:

Valerie: “...I think that it’s much more intense if you black and female, you really now have to, cause I have seen other black guys who also have to really be assertive to get their point across, so you can only imagine how difficult it is then if you a female first, cause I’ve seen other white females having to be assertive when they talking to their male counterparts like okay, male white people, so now you have a combination of both, you female and you black, so its 5 times harder for you basically, so you really have to be assertive and it is because you female and it is because you black.”

Gibson & Espino’s (2016) study affirms that their undergraduate engineering student participants experienced similar challenges as black females, due to the stereotypes that are moulded for black females, as the women experience double minorities, being a female and

being black. Based on these double minority identities that black females possess, their experiences become more complex, as illustrated by Valerie. Valerie's narrative demonstrates the intersectionality of varied identities which female engineers possess, as she comments on her race and gender influencing her experiences as a female engineer, illustrating Crenshaw's (1993) statement of multiple identities being experienced simultaneously. Hence, identities cannot be viewed in isolation, nor can they operate in isolation, as illustrated by Valerie.

Furthermore, the characteristics that female engineers are required to learn as well as assert in the engineering sector become normalised and internalised in the engineering environment and are therefore appropriated as reported in Palermo's (2004) study. However, these qualities may not be normalised in the individual's personal identity (as a female), as it is learnt behaviour, as noted by Emily and Valerie.

Emily: *"...like we have had shouting matches in front of other people and I'm like I just actually don't care, for me that's unprofessional but I'm like this is my area, these are my boundaries, you will maintain and I will not keep quiet. Buts that also horrible because then you constantly forced to this space where this is not how I deal with things, that's not how I approach a situation, but you have to engage in like the male mindset to get them to understand..."*

Based on Emily's excerpt, it is evident that Emily is forced into an approach which she may not be comfortable with, however, she asserts that this behaviour which is required in the engineering environment. This illustrates Faulkner's (2009) statement of the minority group being required to adopt to the dominant culture of the organisation. Furthermore, gendered behaviour becomes entrenched in male-dominated organisations, and therefore, women have to adapt to such behaviour. When the accepted gendered behaviour is deviated against,

discipline will take place. Therefore, female engineers are ‘forced’ into acquiring the acceptable behaviour to avoid criticism and subjugation (Anderson, 2004).

Additionally, Emily asserts that constant strategizing is required in order to engage in the male mindset:

Emily: “.... *its strategizing all the time, you can’t just be and go and we not a team. And its watching your back and trying to find out what else is happening...*”

By engaging in the ‘male mindset,’ Emily illustrates that female engineers are required to engage in the dominant mindset, and are therefore, required to adapt to the pre-existing culture. Similarly, Valerie reports on the implications of the acquired behaviour on her personal identity:

“...*I’m no longer emotional about it, I know this is how it is and not just there at work but even outside here in the world you really have to know like, not everyone is kind, not everyone is always going to be nice. Having that confidence now that I have now, that I didn’t have in the beginning, will, is what’s going to help me deal with all of this nonsense.*”

Valerie and Emily’s excerpt affirms Bastalich et al.’s (2007) study, as the authors comment on women depersonalising emotions and recognising the feelings of the males in order to succeed in the industry. Based on the above excerpts and experiences of the female engineers it is evident that a few of the participants conform and internalise traditional masculine behaviour. This can be likened to the notion of ‘doing gender’ by West and Zimmermann (1987). From a social constructionist point of view, participants engage in appropriate masculine characteristics such as, ‘*assertiveness*’, ‘*aggressiveness*’, ‘*engaging in the male mindset*’ and ‘*forcefulness*.’ Therefore, due to the masculinised culture of the engineering environment,

‘doing gender’ requires the participants to adopt a ‘masculine identity’ in order to perpetuate the status quo of the masculinised engineering environment. As the women are adopting ‘masculine’ characteristics these may not be considered appropriate behaviour for women and is therefore, learnt behaviour, forcing women into a space which they may not be comfortable with as noted by Emily. Valerie and Emily also note the inappropriateness of ‘feminine characteristics,’ as Valerie states, how she is ‘*no longer emotional about it,*’ and Emily asserts that ‘*you can’t take it personally.*’ Therefore, in order to conform to the engineering environment and to be a successful engineer, characteristics that are perceived as feminine are counterproductive in the engineering environment, as illustrated by Palermo (2004). However, by doing so, a divide is formed which perpetuates gender inequality (Lahiri-Dutt & Macintyre, 2006). In addition, Robinson (1991) states that to be “taken as an engineer is to look like an engineer, talk like an engineer, and act like an engineer” (p. 406), illustrating why the female engineers tend to adopt masculine characteristics in order to succeed in the engineering environment and to be taken seriously. Furthermore, Emily, Maskell-Pretz and Hopkins (1997) affirm that women are uncomfortable when adopting aggressive and assertive characteristics, as by doing so, a devaluation of the women’s feminine attributes takes place. In line with this, Faulkner (2009b) postulates that despite the fact that women are highly visible as women in the engineering environment, they need to become invisible as women by downplaying their feminine characteristics and adopt these ‘masculine’ characteristics, which Jorgenson (2002) labels as, ‘disqualifying femininity.’

Olivia’s notes this in her narrative, as she states that the appropriated workplace behaviour extends into her personal identity, which has a negative effect on her personal life:

Olivia: “...*I find that sometimes I’m overly aggressive, where the punishment doesn’t fit the crime, maybe because I’m still on that mode, that work mode...*”

Olivia: “*And I think that’s directly related to being in that field where constantly, where its allowed and encouraged and not seen as being strange, to be openly aggressive and feisty. So, because it’s a natural part of me I am openly so, like that at work, and we at work a lot of the time, I mean 8 hours a day, Monday to Friday so I’m usually like that and it’s difficult to just switch it off...*”

Olivia makes reference to the ‘aggressive’ behaviour that is normalised and encouraged in the engineering environment. As this behaviour is considered appropriate in the engineering environment, Olivia internalises this behaviour in her personal identity, which has formed complexities for herself pertaining to the relationships in which she engages in. Furthermore, Olivia experiences dichotomous feminine and masculine behaviour, as there is a tendency for her to negotiate a balance between masculine and feminine behaviour. These tensions have been experienced by female managers as they often experience tension in negotiating an intermedium between the dichotomous behaviours, as with Olivia’s narrative (Palermo, 2004). In addition, as masculine traits such as self-reliance, detachment and independence are infiltrated in the engineering industry, women experience dichotomy pertaining to whether they should adopt such characteristics, in fear of losing their femininity, as experienced by Olivia (Seymour & Hewitt, 1997).

Based on the experiences that the females have had, many have noted the effects of the experiences on their personal identity. Most of the participants would have a positive stance on the implications of engineering environment which would motivate and encourage them to build own their own personal characteristics, in order to assist them in succeeding further. These characteristics include, *developing myself* (Sumitha), *builds character* (Valerie) and *confidence* (Emily). Moreover, an effective strategy that was evident in the literature was becoming ‘one of the boys,’ therefore, adopting masculine characteristics in order to create a

sense of belonging to the engineering culture, which ultimately affects the experiences of the engineers.

4.2.2 Social, Relational and Professional Identity

Many of the participants acknowledged that their social role was not affected by being a female engineer. Therefore, the participants were able to fulfil their social roles to the standard in which they preferred.

One of the participants noted that being an engineer does not have as much impact on her life as one would imagine:

Olivia: *“The impact is not as big as what people would think because I know a lot of the time people get shocked that you an engineer and a female and thinking, yoh, what’s your world like, it’s pretty normal.”*

A stigma is formed around engineers lacking a social life (Gibson, & Espino, 2016), which Olivia confirms, as she asserts that even family members tend to believe that she will not have time for them due to her being an engineer. However, this was not evident in the participants’ narratives, as the majority of the participants acknowledged that they are able to fulfil the social life which they preferred. In addition, the participants asserted that their professional identity did not impact their social life as much as society would expect. Despite the majority of the participants asserting the lack of impact of their professional identity on their social identity, one of the participants stated that she does become discouraged to participate in social events, as a result of the challenges that she faces in the engineering environment. Hence, her professional identity of a female engineer plays a role on her social identity.

Emily: *“....finding the energy to go out and socialise you like arg, I’d rather sit on the couch*

and sleep, that plays a role.”

As many of the participants’ social identity was not affected, it should be noted that many of the participants worked at companies that allowed for flexi-time, therefore, allowing the engineers freedom to choose their own hours, enabling their social life. Thus, the type of engineering industry may have played a role in the women’s social identity. An individual’s social identity constitutes of their belonging to a social group based on common characteristics (Tajfel, 1978). However, in this study social identity refers to the social identities and activities that one engages in outside of the engineering workplace, which includes the social activities that the female engineers involve themselves in.

In addition, the stigma that is associated with engineers having a poor social life is evident in Garcia and Espino’s (2016) study on engineering students. The authors state that women in engineering are perceived as women that have a lack of self-care, wear glasses and do not have a social life, illustrating the stigma that surrounds engineers.

Additionally, the majority of the participants asserted that the company was understanding towards the various social roles in which they maintain and therefore their professional identity had not influenced their social life. However, the social roles that women partook in apart from being an engineer influenced their professional identity, as the participants acknowledged that the social roles that they were involved in allowed for them to form and maintain relationships which enabled them to progress in their career:

Emily: “...*I think those roles, I think it’s a nice way to connect with other people.*”

This was shared by three of the participants, as their social lives allowed for the women to enable relationships that would be beneficial to their professional identity, as these relationships would allow them to network and form bonds with others that will be

advantageous in their career. These bonds and networks that the women form can assist them in terms of career advancement, as they are able to form mentoring networks which could ultimately assist in their career progression (Maskell-Pretz & Hopkins, 1997). These informal networks are especially important for female engineers to engage in, as the male-dominated culture of the engineering sector often does not allow for females to be included in these informal networks, as they are often controlled by men (du Plessis & Barkhuizen, 2012).

Furthermore, the field of engineering is deemed 'prestigious', which was reported by many of the participants. As engineering is awarded such a status, this played a role in the female engineer's social identity, as they are often considered role models in their communities, families and neighbourhoods. This was prevalent in the Black African, Coloured and Indian female engineer's narratives, which was interesting as the literature notes that white females and black females chose careers in engineering for differed reasons. White female students would often choose engineering due to their innate abilities of mathematics and science, whereas black females chose engineering due to the opportunities to serve the community (Jawitz & Case, 1998). Therefore, as Black African female engineers were seen as role models and this allows for their purpose to be achieved.

As a result of the status that surrounds the field of engineering, the majority of the participants did not experience resistance when pursuing engineering as a career, except for one of the Indian female participants who experienced racial and cultural resistance, however, continued to persist.

Arianna: *"Ya, so that's why, they sometimes have this, their own uh, uh, whatever they have in their head, status thing or whatever, so ya engineering, it's not, they didn't have a problem, like issues with engineering..."*

It is interesting to note how many of the participants postulated that they are seen as role

models, as much of the literature have noted the importance of role models in retaining female engineers in the industry (Chubin, May, & Babco, 2005; Gallaher & Pearson, 2000; Rosenberg-Kima et al., 2010; Seymour & Hewitt, 1997; Sonnert, 1999; Tang, 1997). In addition, many of the participants have explained the lack of female presence in the engineering industry. As many of the participants acknowledged their role model status, this seems to elevate their status in their communities. Furthermore, many of the participants acknowledged the increase in female presence in the engineering industry. By their presence as women and persistence in the industry they are able to provide mentorship for the 'graduate' female engineers that are entering the industry, which will hopefully retain the female engineers. In addition, the increase of female presence may also encourage females to pursue engineering and eliminate the competency doubts that females may have when choosing a career (Lyon, 2009). It should be noted, however, that only certain industries such as chemical and civil engineering had experienced an increase in female presence. It has also been noted by Etzkowitz, Kemelgor and Uzzi (2000) how gender-related barriers may discourage females from persisting as engineers. These barriers include the lack of role models and social isolation, however, as the women have asserted that they have made a difference in their communities and families, a positive effect manifests for the future generation of female engineers. As women are perceived as role models, this can assist in female engineers experiencing the 'glass ceiling,' as it has been asserted that it is easier for others to relate with people whom are similar to themselves (Palermo, 2004). Lo and Ramayah (2011) postulate that females are more inclined to be better mentors, due to their patience, caring nature and innovativeness. Increasing the female presence will not only allow for mentorship, but also an increase in informal networks amongst the females, increasing opportunities for growth in the organisation (Smith & Dengiz, 2010). Gibson and Espino (2016) also note in their study the importance of role models for their participants. This was especially true for the Black female engineers, as they believed that not

having a Black female role model was frustrating, due to the lack of understanding of the complexities of being a Black and a female.

Although the majority of the female engineers did not report the intersection of their professional identity and their social identity, three of the participants asserted the relationship between their professional and relational identity. Relational identity in the context of the current study refers to the relational self of the female engineers, hence, the relationships that the female engineers engage in apart from being an engineer (Chen, Boucher, & Kraus, 2011). These women would report that being a female engineer was challenging as their 'dating life' was affected by being an engineer, even more so being a female engineer. An intimidation factor was reflected in two of the participants narratives, as they reported that their partners tend to feel intimidated because they were an engineer. Therefore, the female engineer's professional identity played a role in their relational identity:

Olivia: "...it's a big hurdle to get over before things are normal, initially once they know what I do for a living."

In addition, Olivia emphasises the influence of her professional identity on her relational and cultural identity, as this was even more challenging for her being a Black African female. Olivia reported that men would question their 'belonging' in her life, due to her independence. In the Zulu culture, the norm is for the male to be the provider of the household, in which Olivia challenges by providing for herself. Hence, males would feel intimidated by Olivia's success. In addition, Olivia notes that the 'intimidation factor' that is evident may not only be applicable to the Zulu culture, but to the 'male ego' in general. This was confirmed by one of the Indian participants, as she states that males tend to be intimidated by the female being an engineer, however, this worsened if the male was not in the engineering profession himself.

Palermo (2004) affirms the intimidation factor in men, as she states that some men have

displayed fear of powerful women. As women enter into a profession that is male-dominated, the women are challenging the hegemonic masculinity, even more so if the women persist and succeed in the industry. According to Connell (2005), hegemonic masculinity refers to the subordination of women and the domination of men. Hence, power relations are formed between the men and women, in which men dominate the 'superiority status.' However, Connell (2005) further asserts that hegemony can be challenged, as it does not have full control. This is illustrated by the participants, as by entering into a male dominated profession, as well as illustrate traits of independence, the men in their relational lives feel intimidated and challenged, as their status of domination is being contested. This is illustrated by one of the participants, as she states that this is worsened if the male is not an engineer. In this context, the male feels intimidated by a woman that is more successful and powerful than himself. Success in the context of the current study is based on the female's career and remuneration. The notion of hegemonic masculinities is further challenged in cultures which perpetuate male dominance and the subordination of women, as the men are believed to be the bread-winner, however, Olivia provides for herself and is independent within her culture. Furthermore, Olivia states that this is not only applicable to her culture, but is generalised to the 'male ego', which was illustrated by another participant. Interestingly, these narratives were only reported by Indian and Black African participants, therefore, the role of culture may be significant, as the patriarchal ideologies may be more dominant in cultures such as the African and Indian culture.

The notion of challenging hegemonic masculinity tends to be evident in the workplace as well, as Anika reported that her experience has been complex being an Indian female engineer. Anika asserts that the male engineers would formulate expectations for her based on her racial and cultural group, grounded on stereotypical and preconceived standards and expectations that Indian females should prescribe to. These standards and expectations were formulated by both the Indian racial group (her own racial group) and other racial groups in the workplace. Based

on the stereotypical expectations, the males would make decisions on her behalf based on assumptions they had about her race. In addition, Anika would not be consulted during the decision-making process. As Anika did not prescribe to these standards and expectations, she experienced a large amount of resistance from her own racial group. As a result, the Indian males would provide negative feedback as she did not meet the racial and cultural expectations that they had formulated for her. Furthermore, Anika notes that she is perceived as competition to her male counterparts, confirming the intimidation factor that is prevalent amongst successful women (Palermo, 2004). As a result of the masculinized culture of the engineering environment, men's values are prevalent in such cultures which primarily consist of individualism and competition. However, as these values are not associated with women, they often feel isolated and experience the environment to be stressful as these are not common values for women (Tang, 2000; Wentling & Camacho, 2008).

As noted with Olivia's relational experiences, it seems as though Anika may be experiencing these challenges as a result of her challenging the hegemonic masculinity, as Anika feels that she is competition for the males and may therefore be considered a threat. As the men have cultural and racial expectations for her in which she does not subscribe to, the men's dominant status in society is challenged. Furthermore, Faulkner (2009b) states that women that enter into male dominated fields tend to be harassed, sabotaged and resented, which may indicate some form of threat. Hence, the males tend to feel threatened in relation to their job security as well as their masculinity. Furthermore, Anika's resistance to the cultural and racial standards and expectations can be viewed as her practising a form of 'discursive resistance.' This is illustrated in the above excerpts narrated by Anika, as 'discursive resistance' "allows those who are 'subjects' of power to act otherwise and reject their confinement and self-subjugation within pre-determined discourses of power/knowledge" (Caldwell, 2007, p. 78). As Anika challenges the discourses and expectations that have been prescribed to her, she is illustrating the notion

of discursive resistance.

Anika: “...No, I mean they are nice people but in terms of knowing you as a person, instead of asking you would you like to go wherever, oh no she can't go because you know she's Indian and Indians are very conservative.”

Anika: “I didn't come here to sit and do nothing so they like okay, so there was another white environmentalist female, and said to me, I was very shocked that you came and I'm like why? No because like Indian girls don't go anywhere.”

Based on the racial and cultural expectations and standards that have been prescribed, Anika evaluates the competitive culture that is formed between herself and the Indian males, which hinders her career progression. This was also confirmed by another Indian female engineer as she has also experienced the competitiveness culture between the males and the females, which demonstrates that some males feel intimidated and competitive towards the female engineers.

Contradictory to the other Indian female engineers, Arianna states that there may have been one or two incidents of competition between herself and the Indian males, however, she believes that this is dependent on the attitude of the individual, as she has also experienced helpfulness from the males. Therefore, if one has an attitude of eagerness and willingness as opposed to a threatening attitude, most of the males are willing to help.

4.2.3. Deconstructing Race and Gender in the Engineering Field

The female engineers narrated varying experiences in terms of the intersection between race and gender in their experiences as a female engineer. However, a common theme emerged between many of the participants, which was that senior engineers were primarily dominated by the white males, which effected their experience in some manner. As many of the participants acknowledged the male domination of the engineering environment, this affirms

Mostert (2009) and Lewis-Enright et al.'s (2009) statement of the underrepresentation of females in the engineering sector. It is clear that the minimal changes that have occurred since the Apartheid era pertaining to gender role expectations.

The white male dominance that was prevalent in the senior positions of the engineering industry effected three of the participants' career progression in some manner, as barriers emanated between the female engineers and the white male engineers. These barriers mainly consisted of the lack of commonalities between the two groups.

One of the participants noted the impediments in her career progression, due to the racial, language and cultural barriers that was evident in her experiences. These barriers formed complexities for her, as the organisation in which she worked was predominately Afrikaans.

Valerie: *"...I feel like race plays a huge role, race and gender they do play a role in how you progress in the company, cause again it's all about networking, so it's all about before you make relationships with at very beginning of your career I think..."*

As a result of the lack of 'common ground' to formulate informal networks on, Valerie's career progression has been compromised. She noticed the differential progression between herself and an Afrikaans male colleague, as he was not experiencing the cultural, racial and language barrier that she was. Hence, he was able to establish an informal network with the male colleagues, due to the participation in male common discourse on a personal level, which Valerie was unable to participate in.

Valerie: *"So he got to tag along, and learnt a lot, I think learnt a lot more than I could at the time, also being, they have other things in common, even their personal lives, they will discuss rugby this, rugby that, their teams, so that as well helped them I think come close on a personal level so whenever there was something that experienced engineers thought of they'd*

immediately think of him, oh no I think it'd be cool if he saw this cause they already have that like personal attachment because those discussions that they have amongst themselves so I do think that, ya it was partly because of female in terms of sport and things that you enjoy, friends altogether also the language as well like things just sort of jump over your head, you don't know what to say half the time."

This was also asserted by two other participants, who stated that the racial barrier between the white males and the females has affected their career progression in the organisation, as it is more challenging to form relationships with them.

Anika: "...you just don't fit that profile of what they are looking for in the old white boys club so career progression is like a straight line."

Arianna: "...I don't know what to talk to them about, it's a little bit of uh, divide."

Palermo (2004) asserts that women have less contact with dominant networks, which comprises of men, as illustrated by the narratives above. This hinders females' participation in networks. In addition, as the participants noted the senior male domination, complexities are formed for the Black African females, as there tends to be a lack of female role models in the engineering industry, forming impediments for the female engineers, which was confirmed by Gibson and Espino's (2016) study. Additionally, the lack of commonalities are a hindrance to the women's career progression, due to the lack of mentoring networks available. As a result of the lack of mentoring networks and the distinction between the male and female engineers, the 'glass ceiling' is formed for these participants, which is a barrier that hinders female engineers' career advancement (Morrison et al., 1987). As women are unable to form mentoring networks with the senior male engineers, they are unable to progress further than the 'glass ceiling', as the mentoring relationships have been designed to provide the junior engineer with ways to achieve advancement through training and to negotiate barriers in the organisation that the individual

is experiencing (Baxter & Wright, 2000; Fagenson, 1988). Palermo (2004) reports that men are able to utilise these networks to advance their careers, and as noted in the narratives, women are unable to gain access to and therefore, their career progression is compromised.

It is further emphasised in Valerie's narrative that not only does she not have commonalities with the senior male engineers in terms of gendered activities, such as '*hiking and watching rugby*' but also racial and language barriers are fixed, further complicating the relationship between the two. As with Valerie, Anika also experienced impediments when trying to form a relationship with her senior, based on being a female and an Indian. Anika asserts that she is unable to form a relationship, as she does not meet the criterion of what the male engineers are looking for. Therefore, due to the lack of commonalities, a barrier is established affecting her career progression, as with Valerie. Tang (1997) affirms that "being a member of two disadvantaged groups might have a divesting effect on the careers of black and Asian women in science and engineers" (p. 386). This is due to women being in the numerical minority and therefore experience difficulties forming professional networks and finding mentors and role models, as asserted by Valerie and Anika's narrative. Tang (1997) asserts that the being in the double minority contributes to the lack of mobility in the field of engineering. However, despite this, Valerie and Anika assert the importance of establishing networks with the senior engineers in order to utilise the opportunities that are presented. It has also been emphasised in the literature that women experience a lack of opportunities compared to their male counterparts pertaining to career planning, mentoring networks and information sharing. These opportunities have been noted to be crucial in the upward mobility and therefore, as females are excluded, their career opportunities are affected (Cooper Jackson, 2001; Shantz & Wright 2011; Smith 2003)

It is further postulated by Faulkner (2009) that it may generally be easier to work with and

promote those that are similar and likeable to oneself. As men have common interests which may differ from females' interests, social networks are formulated, which are powerful in the organisation. However, due to the differed interests, women find it difficult to place themselves in these networks as illustrated in the narratives.

Although the women experienced challenges in forming relationships with the white male engineers, one of the participants acknowledged that once the barrier had been removed, forming a relationship seemed to be easier. Furthermore, she states that the intimidation factor that she experienced may not actually be true and may be a result of her own perceptions:

Arianna: “...*I’ve learnt so much more , I’ve learnt, I’ve made a lot more friends that way, not only friends I’ve got like mentors , a lot of them are that same old white men, but I can meet them anywhere and talk about anything , not just work stuff cause um, I kind of figured you know what? it might just be me feeling that intimidation and uh, it doesn’t exist , so um working through that its actually opened up a lot of more doors and made it much easier to work in the industry. I think, it’s like now, I won’t feel uh intimidated in a situation, whatever it is, um much more confident and I, realised it’s a lot to do with what I’m actually thinking so it’s, I know there are, I know there will, I know there are still people in the industry that will have that type of thinking that you not good enough but there are very few now so...*”

Based on the above excerpts it may be that the barrier that is formed is a preconceived idea that women have when entering into a male dominated industry, however, may not necessarily be true. Additionally, despite the complexities that are formed due to the existing racial barriers, these complexities usually occur on a professional level, as the senior engineers have been reported to be ‘good people’ on a personal level.

Despite the challenges that have been reported, the majority of the participants have noted that their race has not impacted their engineering experiences negatively. In addition, the

participants that experienced challenges, would generally not experience them with clients.

Anika: “....*Uh, I haven’t had a bad experience with any of the clients thus far...*”

Interestingly, it was also asserted by a white female engineer that based on her experience, being a white female is more well-received by clients than those of other races, but this was her own perception regarding what she has noticed in the engineering industry. However, many of the participants noted that their racial group has not created challenges for them.

Isabella: “*it, like me being a coloured doesn’t affect anything or um, change people’s perception of me...*”

Furthermore, company policies prevented any form of racial discrimination to occur, as narrated by two of the participants. Olivia also notes that the nature of the work eliminates the space to offend each other:

Olivia: “*Um...(pause), well because it’s such a, it’s not a, position or job where your interpersonal skills need to be strong, we work with data, we work on equipment, we are designers, we are scientists, so there’s no room really for people to step on your toes. In terms of personal beliefs and culture, it just doesn’t come up, it doesn’t need to, cause of the nature of the work.*”

This was also confirmed by another one of the participants who stated that it is easier to bond with other engineers.

Although many of the participants did not acknowledge the role of their racial group in their experiences as a female engineer, many of the participants would make reference to the B-BBEE Act and the effects of such on their professional identity. Conflicting narratives were reported amongst the racial groups, regarding whether BEE was in their favour or not in terms

of career progression. Many of the white female engineers would acknowledge that BEE has not been in their favour. However, a few participants from the other racial groups have asserted that the BBBEE Act has favoured them in terms of career progression and the opportunities available for them.

Valerie: *“I really do think that there are sort of advantages to of being black and being female and being an engineer at the same time, in terms of career progressing, progressing further as an engineer, there’s definitely a number of opportunities.”*

The Broad Based Black Economic Empowerment (B-BBEE) Act has been implemented in South Africa as a result of the injustices of the Apartheid era. The objectives of the B-BBEE Act are: to empower broad-based black individuals by promoting economic transformation to enable the participation of black people in the economy; to achieve change in the racial composition of management and ownership structures, as well as in skilled occupations of existing and new enterprises; to increase the extent which black women manage and own new and existing enterprises and to increase their access to infrastructure and skills training as well as economic activities; to promote investment programmes which leads to broad-based and economic participation by black people to achieve general prosperity and sustainable development and lastly, to promote access to finance for black economic empowerment. As many of the participants that are classified as ‘black’ in accordance with the B-BBEE Act have made reference to the B-BBEE act meeting its objectives for them (Republic of South Africa, 2003). Therefore, the B-BBEE Act has enabled change in the South African workforce. This is especially important as many of the participants have noted that many of the senior positions are still occupied by white males, as well as many of their colleagues are white males (ibid, 2003).

4.2.4. *The Role of Motherhood*

Only one of the participants in the study performs a dual role of being a mother and a professional. However, Vanessa acknowledges the intersection of her professional identity and her role as a mother, as she narrates that being a mother in the engineering field is challenging due to the demands inherent in the job.

Vanessa: “...if I had to go back and study again and knew about being a mom and knowing what engineering demands of you, I might not have chosen it.”

An incongruence is formed in Vanessa’s narrative, as there is a sense that she feels as though she is missing out on her children’s childhood and lives, however, states that this may not only be applicable to the engineering industry, but any working mother in a profession. Therefore, Vanessa acknowledges the interception of motherhood and a professional identity. Furthermore, Vanessa also reports a contradiction in her narrative, as she states that she is working to give her children a better life, however, questions whether she is spending enough time with her children. In addition, Vanessa reports the complexities that manifest from a demanding field such as engineering as well as the role of motherhood, as there may be a need to take time off in order to fulfil one’s role of being a mother. However, one’s professional identity has the potential to suffer, as being an engineer requires one to meet deadlines, which may be in conflict with one’s role of being a mother, as these two roles do not always coincide, due to the unpredictability of being a mother.

Elizabeth, although not a mother, also acknowledges how challenging it must be for a mother and believes that performing her various roles and duties would have been different if she had to have children. She asserts that being a mother and a professional is more challenging, due to the various responsibilities one has as a mother and even more so, as a working mother in a demanding industry. The conflict that employed mothers experience was prevalent in the

literature, as Watts (2009) and Jorgenson (2002) acknowledge the difficulties mothers have when attempting to balance the role of a professional and a mother. However, as Vanessa asserts, these roles do not always coincide, which therefore, may have an impact on her career advancement. Additionally, Mostert (2009) acknowledges that a work-life balance is one of the greatest challenges that South African women experience.

Schwartz (1992) notes that complexities are formed for working mothers, as the mother needs to balance their advancement opportunities and family aspirations. Substantiating this, Vanessa notes that balancing being a professional and a mother is a demanding and challenging role, as well as has implications on her psychological well-being as she doubts whether she is there enough for her children. Isabella, although not a mother, asserts the importance of dedicating one's time to their career as a junior engineer as well as a female, as time becomes limited once becoming a mother.

Isabella: *"...all the juniors do that so that they can um, make a name for themselves, so I think now, being single and not having children might be the perfect time for you to move up in your career because when you become a mother one day you won't have that time to do it."*

Sonnert (1999) asserts that women have three clocks in which they need to consider, these include their biological clock, their partners clock, and their own career clock. This confirms Isabella's narrative of having to plan one's career progression before having children. In addition, Isabella's narrative acknowledges the ideology of the 'ideal worker' who is able to progress vertically in the organisation without interruptions (April, Dreyer, & Blaas, 2007). Isabella devotes her time to the organisation in order to progress, hence, ensuring that when she enters motherhood, she does experience professional damage. This can be likened with Gill et al.'s (2007) study, as she states that women are often required to plan their pregnancy, to ensure that professional damage does not occur.

Despite the challenges that women experience as working mothers, Vanessa acknowledges that she has not experienced challenges when trying to balance the different roles in the company. However, she asserts that other female engineers have experienced comments by the other engineers when performing the dual role of being a mother and a professional. This can be likened with Ranson's (2005) assertion that once a woman becomes a mother, she is no longer 'one of the boys,' hindering her acceptance in the engineering environment. Additionally, one of the other participants, (who is also not a mother), states that many female engineer graduates are put-off by the environment and the lack of flexibility that the engineering environment offers when one has children, this was noted in the literature, as engineering is considered a profession that does not allow for family flexible policies. However, this assertion is contradictory to Vanessa's experience (Frome et al., 2006). She also notes the commentary that takes place when women leave early in order to fulfil their role as a mother. These experiences are amplified in Watt's (2009) and Jorgenson's (2002) study, as the engineer's commitment is questioned when using such a strategy to perform the roles as a mother and a professional. A belief in society is that it is not possible to be both a mother and a professional, as one of the roles needs to be sacrificed. Vanessa manages balancing both roles well, however, this may be due to the company's policies and procedures. In addition, Vanessa acknowledges the importance of a support system when performing the role of a working mother. As a result of the support system in which Vanessa holds, this may have enabled her role as a working mother.

Watts (2009) notes that being a father is an obligation that is not associated with his professional career, however, a woman needs to negotiate her responsibilities in order to be able to maintain a professional and parental role. As a woman, this provides additional stress, and she may experience negative remarks from her colleagues questioning her commitment as an engineer. This indicates an undermining of her ability as an engineer, which men may not

necessarily experience. Vanessa confirms Watts (2009) statement in her narrative, as she states that women have a role to fulfil, whereas men don't always notice these responsibilities, as it is more than likely going to be fulfilled by the mother of the children.

As Vanessa has not experienced these challenges in the workplace, she reports that this may also be due to the role of her supervisor, who is also a mother. She also asserts that the company accommodates her needs as a mother and a professional, as the company allows for flexi-time, allowing the employees to work in their hours when they need to perform their roles outside of the workplace. Additionally, the literature suggests that once female engineers have children they are no longer visible as engineers (Faulkner, 2009a) and therefore, their male counterparts progress further in their career, however, in Vanessa's narrative she does not report the competition in career progression between her and her male counterparts. This may be due to her already having a high status as an engineer and has a substantial amount of experience as an engineer. Additionally, Vanessa acknowledges the support structures in which she has in place, which Jagacinski (1987) asserts is influential in the persistence of female engineers.

4.2.5. Engineering Implications

Many of the participants would adopt a positive stance on the challenges that they may have experienced being a female engineer, however, a few participants have acknowledged the effects of the hardships on themselves. Despite the few reported negative implications, the participants in the study continue to persist as engineers. Only one of the participants acknowledged the negative effects of the engineering environment and being a female engineer and how this negatively impacted her life.

Two of the participants asserted that the challenges that they had experienced allowed them to form a new outlook for themselves and benefitted them, as they would continue to persist and

‘push their limits’ as an engineer. Therefore, a positive outlook was taken on the challenges in which they faced.

Arianna: “...and I found that it helped me because, I ended up knowing more than them, I made an extra effort to go and learn how these things work, sometimes the guys they have an idea of how it works, how certain things work, and then they just run with that idea and it might, might not be completely true, so whereas I went and I put in a little bit extra work to figure out how it works and then I understand it a bit better, so ya it just I think it makes you want to work more.”

Valerie: “...instead of looking at all of these things as negatives, I managed to look at them as positives, like you know what, at the end of the day what I presented he didn’t understand, wasn’t good enough simply means that I have to go back and...do more work and convince them because I know what I’m doing and doing more work is really helping me because I’m learning more about what I’m doing in the process, so I felt like all of these challenges really made me stronger, made me more confident and have really increased my work ethic cause now I pay attention to detail, a lot more attention to detail, I know what, I’m always confident in what I’m presenting cause I know I probably looked at every single thing of, and if you point out something, like okay you missed this, I won’t feel like oh, you picking on me anymore, it’s more like oh okay, I know I can do that, I’ll go do it and come back.”

Despite the subtle challenges that these women have faced, the majority of the participants acknowledged that their experience as a female engineer has been positive and has helped them to develop confidence and resilience as an individual. Furthermore, Emily asserts that due to her positive experiences as a female engineer, her confidence and resilience has allowed her to overcome challenges that she is currently experiencing. However, she asserts that a graduate engineer may experience these challenges in a more negative light and may not be able to

overcome them with the same attitude that she has. This can be likened to Gill et al.'s (2008) study, as she asserts that young female graduates are more likely to consider moving firms and locations, therefore, the early experiences that female engineers have can affect their persistence in the engineering field. However, the effects of the challenges for Emily is still evident, as the hardships have affected her negatively. Despite the recent challenges, Emily notes that her experience as a female engineer has been positive.

In addition, many of the participants asserted that they had not experienced discrimination as an engineer and were treated as an equal. Many of the participants would acknowledge the prestigious status of being an engineer and how this had affected their self-esteem, as Emily notes, an 'ego-boost.' The field of engineering is also considered a 'thankless job,' which provides inner satisfaction. Furthermore, it is also rewarding overcoming work-related challenges as an engineer, as it increases one's confidence, which is beneficial in the future.

Ayre et al. (2013) notes in their Australian study that their participants also found the engineering environment to be strongly masculinized and therefore experienced isolation, being overlooked and unheard. However, they continued to persist as engineers, as well as enjoyed the engineering environment. Therefore, as illustrated in the narratives, a few of the participants acknowledged impediments, however, continued to persist, as well as adopted a positive stance to challenges. This was illustrated in the literature, as many of their participants would become more determined when tested, as illustrated in Valerie's narrative (Ambrose, et al., 1998; Bastalich et al., 2007). Buse (2011) noted that women who persisted demonstrated traits of self-efficacy and confidence. This was demonstrated in the narratives, as those that had experienced challenges would become more determined and confident.

Furthermore, Cech et al. (2011), states that those that possess professional role confidence are more likely to persist in their careers. However, the authors assert that there may be a gender

variation in professional role confidence, as they state that women are less likely to form professional role confidence in professions that are male dominated due to the cultural biases that men are better at the profession, due to their natural fit are less likely to form professional confidence in occupations that have masculine cultures, as their professional role is developed through socialisation. Cech et al. (2011) notes that professional role confidence may be more prominent in males than females, justifying their persistence in the field of engineering. However, based on the participants' narratives, many of the participants noted that they felt confident in the field of engineering and when accomplishing tasks that are challenging, a sense of achievement is formed. Most of the participants did not indicate that they had intended to leave the field of engineering, indicating their persistence in the field of engineering. This corresponds with Ayre et al.'s study (2013), as in her study she notes the confidence that her participants portrayed, consequently asserting that they do belong in the field of engineering. Moreover, the majority of the participants were not married, nor were mothers and this may have impacted their persistence in the engineering sector, as Buse et al., (2013) and Jagacinski (1987) assert that persistent female engineers are less likely to be married with children.

4.3. Mediating the Two Extremes

The majority of the participants narrated what seemed to be a contradiction between being treated as an equal, as well as standing out as a female. Therefore, the two extremes are formed, as women would narrate incidents in the engineering environment that would not occur for the men, consequently, forming a divide between the men and women. However, women narrated that they are also treated as 'one of the boys' and an equal. The contradiction of narratives will be uncovered based on the experiences that women have had.

4.3.1. *'Standing Out as a Female'*

Eight of the nine participants reported that they had experienced some form of sexual harassment as a female engineer. The sexual harassment incidents ranged from sexual commentary, staring, whistling to wanting to form romantic relationships with the female engineers. There was only one report of minor physical sexual harassment. Interestingly, these incidents were largely conducted by other males, who were not engineers such as the contract workers, cleaners, the security guards and males from other companies, therefore, these individuals would not interact with the female engineers on a daily basis. The incidents that occurred to the women resulted in the women feeling uneasy and uncomfortable, as Emily reports:

"...if you walk along they all stare at you, other women have commented about it as well, like you're in overalls, they not pretty and you feel naked how they look at you."

Many of the women would resolve these incidents themselves and establish boundaries in order for these incidents not to occur in the future. As a result, the women needed to demonstrate assertiveness to resolve these issues. It was prevalent in the narratives that the sexual incidents that occurred only took place because they were female, hence, would not be a typical encounter for a male. These incidents also were not a common occurrence, however, had occurred at least once or twice for the eight participants.

Elizabeth: *"...so I think if I was a male I wouldn't have got that problem."*

Sexual harassment has been noted as a work-environment barrier that impacts the professional progress of the women, as well as their psychological well-being (Catalyst Report, 1992). In addition, sexist comments and jokes undermine the female engineers. However, in this study,

the women did not acknowledge the effects of the sexual harassment incidents on their well-being, especially as the majority of the women would confront the situation immediately. Faulkner (2009) notes how female engineers have experienced some form of unwanted flirtatiousness or sexual harassment, which is a consequence of being a female in a male dominated field. As Elizabeth notes, she doesn't believe that it would have occurred if she were a male. The experiences of sexual harassment were also confirmed in Bastalich et al.'s (2007) study. These occurrences are prevalent in the engineering industry, as a result of the salience of the female presence, therefore, women are subjugated to sexual incidents. In addition, it has been noted in the literature that women that occupy non-traditional occupations are more likely to experience sexual harassment, confirming why female engineers experience these harassments (Bastain, Lancaster, & Reyst, 1996; DeSouza & Solberg, 2003 & Illies et al., 2003).

Five of the participants narrated the protectiveness and helpfulness culture in the engineering environment, which was primarily due to them being a female. The participants narrated the willingness men had to help them, as well as afford the women extra attention. The participants would acknowledge the eagerness men portrayed to do physical work for the female engineers:

Isabella: *"...they are more helpful towards women, but especially if you need to climb up things, take samples, they will offer to do it for you."*

Coupled with the helpfulness culture that has infiltrated the engineering environment, a protectiveness and nurturing relationship is formed, in which the males tend to protect and nurture the female engineers. Hence, women are awarded extra attention based on their gender. Although this was not perceived as an issue for the women, differential expectations are formed for the male and female engineers, perpetuating gender inequality, as the male engineers would

not have received the same attention. Zening-Arslan (2002) asserts that due to the feminine imagery of females, they are naturally seen as weak and therefore require protection and assistance from men, therefore, are sheltered and are required to perform the socially constructed responsibilities of females, i.e. housework. This was illustrated in the narratives, as women were often assisted by the males, indicating their incompetence and inability to perform.

Similarly, a few of the female engineers would acknowledge the differential treatment when attending site visits. Women would often be discriminated against when attending sites, generally as a result of them being female. Two of the participants acknowledged the exclusion from site work based on their gender, as the site “*is not really for girls*”. The other participant noted that a certain criterion is used when deciding on which engineer would be attending the site visit. If the women do not meet the criteria, they are excluded, negating their opinion in the decision-making process. The male engineers would decide for the female engineers whether they would be able to manage the site or not, and if not, a male engineer is allocated instead:

Arianna: “*...if they think it’s going to be a hectic site, where there’s going to be lots of work and lots of like, I don’t know how they, they’ve got criteria they use, but its uh, they sometimes, sometimes there’s cases that I know of where, not the companies I worked for but like other companies some of the girls say no, there like a really nice project and they wanted to go on site and work on this project and they were like no, I don’t think you’ll manage on that site, lets send this guy.*”

The criterion that is used for the engineers, may coincide with the helpfulness and protective nature that the men tend to have towards the female engineers, as the men are protecting the women from attending dangerous sites. However, by doing so, a barrier is formed between the

men and women in terms of their physical abilities and their suitability for the site. As well as undermining their competency as an engineer. Additionally, the women are not consulted regarding their opinion about the site, but decisions are rather made on their behalf. This was worsened for the one participant, as assumptions were made about her racial group, and was therefore excluded from attending the site.

It has been noted in the literature, that women often receive different treatment to their male counterparts, as they receive extra attention and ‘protection’ from the shop floor. Additionally, women receive a lack of practical opportunities, based on being a female, as illustrated by the participants in which they are discriminated against attending site visits (Horgan, 1989; Kanter, 1977, Morrison & Von Glinow, 1990). It has been noted that the male engineers are protective in the manufacturing environment and therefore, discourage females from working on the plant, subsequently, denying them practical experience. Holth (2014) asserts that women are often denied practical experience and therefore, treated as observers. This can be likened to the participants’ experience, as the males have a criterion in which needs to be met in order to decide which engineer will be attending the site. However, by doing so, the male engineers are perpetuating gender inequality, as they are stating that the female’s do not have the adequate capabilities to perform all tasks as an engineer. Furthermore, it has been noted that men have a tendency to nurture women, as noted by Powell et al.’s (2011) study on engineering students in the United Kingdom. The authors note that female students receive additional help from staff, as they believe they are supporting them. However, the extra attention and nurturing relationship that is formed may be an example of a paternalistic relationship that is created between the males and the females. This is confirmed by Olivia, as she states that her manager and herself have a father-daughter relationship. However, by affording extra attention to the female engineers, not only are the males performing differential treatment between the male and female engineers, but a possible consequence may be that women are perceived as less

competent, especially in terms of practical tasks. Based on the differential treatment between the male and female engineers, women are not afforded the same practical experience as the male engineers. This has serious implications for the female engineers, especially those that intend to register as a Professional Engineer, yet are not afforded the opportunities to attend certain site visits, as a result of not being able to attend the sites. In the process, the women are unable to meet the criteria for a Professional Engineer (Powell et al., 2011).

Furthermore, it has been reported by a couple of participants that site work is a bit more challenging for females, based on biological differences, as there is frequently a lack of toilets on site, which becomes challenging for females. However, it has been noted that there are some sites that do have portable toilets now, but these are still not ideal for women. Despite the accommodations that have been made for women on site, these factors do create a divide between the men and women, however, the companies have tried to accommodate women to do the best of their abilities. Ayre et al. (2013) notes as a result of women being in the numerical minority as female engineers, their sensitivities are often overlooked, as illustrated in the narratives. In addition, it has been mentioned by the two of participants that men are naturally more physical and are therefore able to endure on sites without becoming as tired as the women. However, this does not make site work impossible, but rather more challenging. One of the other participants also noted that being an engineer is physically intense, especially during shut down, therefore this may be easier for the males than for the females. Hence, a physical barrier is created between the men and women, as the women have noted that there are certain tasks that may be more natural for the men. Based on these narratives, a contradiction is formed, as most of the participants state that they are treated as equals and have not been discriminated against, however, have also reported that they are not equal to the men and therefore award men the 'superiority status' and acknowledge that men are compatible with the physical requirements of an engineer. Furthermore, the workplace attire is not accommodating for the

female engineers. It is a requirement for some of the engineers to wear personal protective equipment (PPE), however, it was asserted by one of the participants that this attire is generally designed and made for men. Hence, the equipment does not fit the women correctly, subsequently resulting in challenges for the female engineers.

Another factor that was asserted by one of the participants, which created a divide between the men and women, is that the leader of the project would often not be awarded to the female engineer, as they would initially be used as assistance, therefore, it is automatically assumed that the male engineer would lead the project:

Arianna: “...*they always just assumed that someone else is just going to be leading the project and I’ll just be assisting on site...*”

Arianna: “...*Whereas for a guy, it’s almost like they don’t question, they take it for granted that oh no, he can manage it, he’s good enough to handle it.*”

Based on these incidents, Arianna would have to demonstrate characteristics of assertiveness, as her efforts would not be acknowledged otherwise. A barrier is created, as Arianna states that the females work is taken for granted which requires the female to put in more effort than her male counterparts. It was further illustrated by one of the other participants that she would also be assigned the menial jobs. In addition, it was reported that the men would receive credit for work that she had conducted, however, for the work that the men had conducted, Emily did not receive credit. This was also confirmed by another participant, who stated that the male engineers would receive credit for work that she had conducted, while she was not acknowledged. Furthermore, three of the participants made reference to the clients and contractors referring to the male as the project manager and the leader of the project, and if

there are queries regarding the project, the clients would refer to the male in the room. Additionally, the male contractors or clients would instruct the female engineer to “*go back and check*”, therefore, would not direct questions at her, implying that she needs to do double check her work. However, if a male was leading the project, the questions would be directed at him.

This can be likened with Robinson’s (1991) statement of being an engineer, which means to talk, look and act like an engineer, which is synonymous with the male figure. Therefore, clients and contractors would automatically assume the engineer to be a male. This is also applicable to the women being assumed as the helper or the men receiving credit for the female’s work, as being an engineer is likened with the male figure. Faulkner (2009b) coined the term ‘gender in/authenticity,’ which notes the normative pressures of expecting the norm. Therefore, in the field of engineering, the ‘norm’ is considered to be a male engineer, thus, by becoming a female engineer, the women deviate the norm of a male engineer, subsequently resulting in others noticing the visibility of the female engineer, yet, the invisibility of an engineer. Therefore, the notion of a female engineer is incongruent with gender and engineering identities. In addition, Brumley (2004) asserts that the notion of success is often associated with male characteristics and therefore, due to women not possessing such characteristics, a lack of progression is experienced. Therefore, as postulated by the narratives, women would have to adopt such characteristics in order to be acknowledged and recognised as a competent.

Arianna: “...*kind of hint at you know, if they not happy with something, they won’t address it with you, they’ll tell you but they’ll say, go and speak to your uh...manager and come back or, you know like someone, it’s just like a hint but it hasn’t been anything like major, outright major so I haven’t had really like...*”

It also been noted by one of the participants that the contractors are more likely to ‘push their luck’ with a female engineer than a male engineer. This means that the contractors would try extending their time limits with a female engineer, as opposed to a male engineer. Additionally, it was prevalent in the narratives that women would be spoken over as a female. One participant noted that the men tended to switch off when she spoke, as if she was their wife. As a result, the women would need to demonstrate assertiveness and forcefulness in order to be heard and understood.

As the engineering field is male dominated, the discourses that the men engage in are primarily around typical male activities, therefore, the women are excluded from the topic of conversations, due to the lack of interest. A few of the participants have noted the detrimental effects of not engaging in such discourses, as the conversation would usually navigate towards work. Therefore, as the men have engaged in these conversations they are provided with extra information in terms of their projects and work in which the women are excluded from. These conversations are also based on the male’s personal lives, which also forms a bond between them, which the women are generally excluded from:

Arianna: “...for example if they’d be talking about soccer or whatever it is, so I’m not interested in that so I’m busy doing my own thing and their conversation would end up going towards work, so they would end up discussing work and I’m not there discussing with them, so it’s probably not intentional on their side but it happened, um so it would be like they’d ask um, questions or whatever and they already know everything they need to know about the project, so the project, when it’s time to start the project they...um, they ahead of me basically, so it seems like they know more than me and they better than me, but its only because they have been given that extra but of information.”

Phipps (2002) notes that the old boys' network places females at a disadvantage based on their sexual identity. It is also noted by her participants that this exclusion was not intentional, yet remains discriminatory, which was also illustrated in the female engineer's narratives. The discourses that take place in the organisation are an important part in forming relationships and mentorship with the senior engineers, however, women are excluded from these topics of discussion, based on the lack of interest and commonalities. Shantz and Wright (2011) as well as Gill et al. (2008) note that women are often excluded in these professional networks. In addition, Faulkner (2009) notes in her study how these stereotypical male conversations are formed and the implications thereof.

Lastly, two of the participants have noted that there tends to be salary inequalities between the males and the females, as the men generally earn more than the women, regardless of the women's experience. Due to the confidentiality of salaries in organisations, this cannot be confirmed, however, it has been mentioned amongst employees. This also tends to be a trend in the industry, as one of the participants noted that she had experienced this throughout her experience as a female engineer. The gender pay gap has been noted by other researchers as a concern for females in male dominated industries, as the pay inequalities emphasises the differential treatment for male and female engineers. It undermines the female engineer's abilities, as it enforces the discrimination between males and females, as well as inhibits the females career progression (Ashraf, 2007; Feyerherm & Vick, 2005; Martin & Barnard, 2013). Despite the field of engineering being noted as a highly-paid profession, this is not always applicable to graduates and females (Mamaril & Royal, 2008). Women are also expected to exit the profession due to the low salaries.

Two of the participants noted that the issues that have been discussed above are generally soft, subtle issues, which therefore, results in the females persisting as an engineer. Furthermore,

many of the participants would narrate these incidents, however, would not perceive them as real challenges. Despite the women's perception of these challenges, it has been noted that these incidents form a barrier between the men and women. Despite the 'subtle issues' that were experienced by many of the women, the women acknowledged the positive experience they had as a female engineer and were subsequently treated as an equal. This was confirmed by Bastalich et al.'s (2007) study, as the female engineers in their study narrated the similar challenges to the current study, however, this did not impede on their career satisfaction, as noted by the female engineers in this study.

4.3.2. *'One of the Boys'*

Seven of the nine participants narrated the positive experience they had as a female engineer, despite the 'subtle' issues that arose throughout their career, as well as being in the minority, many of the participants enjoyed being an engineer and continued to persist. One of the participants asserted that the challenges that she has encountered has prepared her for her long-term career, as well as allowed her to develop as an individual. Additionally, two of the participants asserted that the divide between men and women was not intentional. The reason that the divide was created may be due to the lack of female presence. Therefore, males are unsure of how to interact with females, as the field has been mainly dominated by men over the years. This is especially true in the civil and mechanical engineering fields. In this way, the female engineers would justify the male's behaviour in the engineering sector. This can be likened to Morandi and Subich's (2002) study, as the authors state that women adopting traditional gender roles may internalise the blame for the discriminatory behaviour and are therefore, inferior. As the women justify the male behaviour, they are internalising the behaviour and accepting the status quo.

Furthermore, five of the participants asserted that they had not been treated differently as a female engineer. Hence, they believed they were treated as an equal. However, two of the participants asserted that the men in the engineering environment, would not behave differently due to the female's presence. Therefore, the men would talk about other women whilst there was a female in the room (Olivia); they would address the meetings stating, 'Mr' and 'gents', thus, treating the female engineer as though she were 'one of the boys' (Olivia), as well as using foul language in front of the women (Emily).

Olivia: *"...usually for me it's not deliberate on their part, it's a conditioning in their minds, and thinking of you as one of the boys until they do something inappropriate and you speak up and say hang on..."*

Another interesting factor that arose in the narratives, is that discriminatory comments were not always made by men, but also by women. Three of the participants noted that they had been discriminated by a female engineer.

Vanessa: *"...well, being the person that I am, I would never have to do it myself, someone will always do it for me, you know, sort of this, sort of implying that you pretty and you friendly, you know, don't worry you'll never have to do it yourself, someone will always do it for you..."*

The participants narratives were confirmed in Bastalich et al,'s (2007) study, as in their study, the majority of the female engineers narrated minimal gender discrimination, as well as being able to get along with the males. Thus, many of the authors participants did not experience gender inequality in the engineering environment. However, Eisenhart and Finkel (1998) noted that women reinforce gender inequality by supressing any form of discrimination. The women in this study as well as Bastalich et al.'s (2007) study note the challenges of working in a male

dominated industry, however, perceive them as ‘subtle issues’ and have therefore experienced minimal inequalities. Only one of the female engineers was highly affected by the male dominated industry, however, the majority of the other participants narrated their positive experiences and reported that they were treated as an equal. Anika’s experience can be associated with the lack of inclusiveness in the culture of the engineering environment, as the inclusiveness of the organisational culture affects the women’s persistence in the engineering industry. Therefore, as Anika experienced a lack of acceptance and career progression, her persistence has been negatively affected (Faulkner, 2009b).

Furthermore, Faulkner (2009a) asserts the notion of ‘he’ to refer to engineering, which is emphasised in Olivia’s narrative, as the common greeting would be addressed to ‘Gents’ and ‘Mr’, negating the female presence. Although Olivia addresses this as a ‘soft’ issue, there are implications of such addresses for future female engineers, as the discourse of male engineers remains prominent, sending a powerful message to engineers, stating that engineering is a male dominated profession and accepting the status quo. Furthermore, as Olivia notes this as a soft issue and therefore, she does not have *‘sleepless nights’* about this, by doing so she accepts the status quo. In addition, Olivia was the only participant that asserted that the boardroom had been addressed as ‘Mr’ and ‘Gents,’ this may be due to Olivia being a mechanical engineer, which is highly male-dominated. Olivia also notes that mechanical engineering is often synonymous with a labourer, as noted in the literature by Phipps (2002). However, due to the false imagery of mechanical engineering, females are often discouraged from entering such a profession, impacting the retainment of engineers.

Furthermore, the notion of equality in the engineering workplace can be likened with Jorgenson’s (2002) study, as in her study she notes that her participants do not note gender issues in their experiences. Many of her participants also noted engineering to be a ‘gender-

neutral' territory, which perpetuates equality for males and females, as with the current study. Eisenhart and Finkel (1998) note how this undermines women's collective action to address their unique concerns as female engineers. These issues are perceived as subtle issues, nevertheless they are still existent in the women's experience. As women do not consider the 'subtle issues' as real challenges in a male dominated environment, the women are unable to challenge the issues that are evident in the engineering environment and therefore, unable to transform the engineering environment to be more accommodating for women. Instead women are having to assimilate to the engineering environment. This statement is amplified in Arianna's narrative as she states:

"...the environment is supposed to accommodate everybody and you want females to come in they give, they uh, they throw in a different perspective..."

The two extremes have created an interesting dynamic for female engineers, as the majority of the female engineers have acknowledged that their experience as a female engineer has been positive and they have been treated as an equal. However, barriers are also formed in the engineering environment forming a divide between the males and the females. Despite the division that is formed, many of the participants did not acknowledge these incidents and challenges as serious issues and most of the time were not deliberate on their part, as a few participants have noted that the males are not accustomed to having females in the engineering environment and therefore, these subtle issues that arise may not be intentional, but rather, a lack of understanding. Many of the participants also did not perceive these issues as 'challenges' but are rather inclusive of their experiences as a female engineer, as women negate the implications of such issues, as well as internalise these 'subtle issues.' In addition, Saavedra et al., (2014) assert that women entering into a male dominated industry are subjected to

marginalisation, discrimination and subjection, illustrating the ‘subtle’ issues that women would experience in a male-dominated industry.

Many of the women emphasised the different statuses that men and women are awarded in society, as by doing so, are perpetuating gender inequality and the women’s inferiority status in the field of engineering. Women internalise these differences between the men and women, as many of the participants would narrate them as part of their experiences and not challenges per se. Therefore, gender is perceived as, “a hierarchical structure of opportunity and oppression as well as an affective structure of identity and cohesion” (Ferree, 1995, p. 125). Consequently, men are afforded a higher status in society, due to their ‘natural’ abilities to succeeding the engineering environment, as many of the participants narrated that the men would not experience the same ‘subtle issues,’ enforcing the differential treatment between men and women. Therefore, by narrating the differential treatment between the men and women, this can be perceived as a form of oppression and power status between men and women. The oppressive forces form a net-like structure, in which men and women maintain the discourses of ‘truth,’ which the ‘truth’ advantages the dominant positions in society (Foucault, 1980).

Furthermore, it has been noted by a few participants that the company’s policies and procedures create an impact in the organisation, as it lessens the amount of discrimination that is tolerated. Two of the participants have acknowledged that the reason for their positive experiences as a female engineer may be a result of the company’s stringent policies preventing harassment and discrimination. It should be noted, however, that many of the participants were in the engineering design industry, which as Faulkner (2009) notes in her study that she observed that the building design services was more gentle and respectful than the oilfield industry.

4.4. Proving Yourself

Diverse narratives were reported by the female engineers, as a few participants would assert that they needed to prove themselves as a ‘female engineer’ whilst the others narrated the importance of proving oneself as an engineer. This was especially true as a junior engineer.

4.4.1. Proving Yourself as a Female

Four of the participants narrated that they felt the need to prove themselves as a female engineer. The participants felt that extra effort was required for them in order to be recognised. Two of the participants noted that they felt the need to prove themselves as a female, however, asserted that this may be a preconceived idea that they had, as there was no direct discrimination towards them. Nonetheless, although there was no direct commentary, the discrimination was often felt. Additionally, the female engineers narrated that as a result of women being a novelty in the engineering industry, the men are unsure of how to act in the females’ presence and therefore, intimidated.

Arianna asserts that extra hours and more research is necessary in order for her capabilities and competence to be recognised. She also asserts that this would not occur if she were a male, as the men are automatically assumed that they are capable to handle the project and will therefore be leading the project, with Arianna as assistance, until she asserted herself as an engineer. This was also the case for a few contractors and clients.

Arianna: “...as a project manager, I, uh, initially they sometimes, you can see that they feel that you don’t know your stuff or whatever it is but, once you start talking and they can see okay, this person knows what they doing and...what’s happening on this project, and especially

if you coming up with suggestions and solutions to the problem, then they start respecting you a bit more...”

Arianna’s experience was verified in Ayre et al.’s (2013) study, as several of the authors participants also experienced having to prove themselves in order to be acknowledged and recognised by the males (colleagues and clients). Therefore, the participants relied on their professional competence to be affirmed by the males, as with Arianna.

Isabella, however, states that her experience has improved, as she has gained more experience, however, initially she felt the need to prove herself. This was especially applicable to the older generation and the artisan workers, as they seemed to more resistant to female engineers. Ambiguity is formed in Isabella’s narrative, as she states that she felt the need to prove herself initially, however, she notes that her experience has improved as she gained more experience. In addition, Isabella asserts that women may have preconceived ideas of having to ‘prove themselves’ in the engineering environment.

Two other participants recognised the role of their race in proving their competency as a female engineer. Therefore, two of the participants have noted the fluid and dynamic intersections of their identities, as well as that their identities are not unified. The participants (Black African and Indian female) stated that they would constantly have to prove themselves and extend the extra mile to demonstrate their competency. This would require lots of hours at work, as well as extra research, which they noted was not necessary for the male engineers. Anika asserts that there is a constant need to prove yourself, and once she has proved herself, she needs to do it again, as *“there is always someone waiting in line.”* This becomes more challenging, as she believes that her own racial group provides the largest obstacles, therefore, there is a constant need to prove herself as an Indian female engineer. By stating this in her narrative,

Anika notes the dynamics that are formed as one possesses various identities, which are not viewed as unified and singular, but are rather fluid and dynamic (Crenshaw, 1989). This is further amplified in Gibson and Espino's (2016) study of Black engineering students, as the students would assert the importance of having to prove oneself in the engineering environment, by working harder. The students had noted their double minorities and how this had affected their experiences. Furthermore, the double standards notion was also mentioned in this study. This had become frustrating for the female engineers as the same privileges were not offered to them as their white male counterparts.

Valerie asserts in her narrative the complexities that manifest from being an African Black female:

"...and if you are a girl and you decide, or a female rather and you decide to voice maybe, maybe correct them, they tend to think you have no idea what you talking about, you have to prove yourself, prove your theory ten times over, like no, whereas they have to say it once, oh this is what I think and if you have to correct them, you really have to go there and have an entire PowerPoint presentation to prove your point, oh no, this is why I'm saying what I'm saying but it's hard for them to take you at your word, whereas if you speaking with another female, I think they give you time, sort of explain yourself, they don't immediately dismiss you, like oh no, you have no idea what you talking about."

Valerie: *"...having to go that extra mile in terms of everything that you do, you really have to do it 10 times better than the next guy."*

Valerie notes that males are more dismissive than females when the female engineer is trying to make a point. Thus, as a female engineer, she needs to strategize before presenting to the

male's, hence, a plan of action needs to be done beforehand, which was not the case for the male's. Although Emily does not mention that she is required to prove herself as a female engineer, she does mention the constant need to strategize and to gain the male's perspective, confirming Valerie's point of having to be prepared beforehand. Furthermore, Emily notes that this requires a large amount of people management.

The notion of proving yourself as an engineer can be likened with Faulkner's (2009b) statement of 'highly visible as a woman, yet invisible as an engineer'. Therefore, it has been noted that it is a lot more challenging for a female to be taken seriously, which has been noted in the literature, as female engineering students and professionals felt the need to prove themselves to their male counterparts, based on their gender (Harris et al., 2004; Pardo et al., 2016; Powell et al., 2011).

As women are highly visible based on their gender, they are often pressurised into performing better than the men (Kanter, 1977). Bastalich et al. (2007) notes in their study that many of their participants needed to conform to the engineering style, as they will not be heard otherwise. This implies reproducing masculine characteristics in order to prove yourself as a female. Furthermore, those that challenge the hegemonic workplace are seen as more as a threat than those that conform to the style, therefore, confirming Anika's narrative, as Anika resists the cultural and racial expectations that are prescribed to her, therefore, may be perceived as a threat.

Similarly, with Faulkner's (2009) study, this does not have a long-term effect for the female engineers, but most have rather taken a positive stance on their own career path and the benefits of having to work harder.

4.4.2. Proving Yourself as an Engineer

Four of the participants made reference to proving themselves as an engineer and not as a female engineer, as noted in the above discussion. Two of the participants made specific reference to proving yourself as a junior engineer, and not a female junior engineer. Therefore, they would work harder to prove themselves as junior engineers, as Olivia states that engineers are valued by the number of years' experience that they have, therefore she felt the need to prove to the male engineers that she is a capable junior engineer. Hence, her gender and race did not play a role. Furthermore, the women asserted that their work would be assessed in isolation from their gender, therefore, they would put in extra effort to ensure their work was of standard, however, this was not dependent on their gender.

Vanessa: *"...you know I was also an eager engineer and showed an interest in everything, so I think from that point of view people were more accepting, the fact that you're an engineer and you want to learn and that you want to do work and you want to, so I don't think it was necessarily proving myself as a female but more proving myself as an engineer."*

Elizabeth: *"...Never...no, no. the companies I've worked for have always been very good, they've always assessed me on my work, not cause I'm a woman."*

As noted in the above discussion, Isabella asserts that the male's perceptions have changed as the junior engineers receive more experience in the field, confirming that many women may enter the industry with preconceived ideas of proving themselves as a female engineer. Isabella's statement may be congruent with proving yourself as a junior engineer and not a female engineer, however, her preconceived ideas and biases may enable her to perceive the engineering environment to be evaluating her competency as a female, however, this may be based on evaluating her as an engineer as she has not received any direct commentary. Hall,

Shmader and Croft (2015) asserted in their study that social identity threat may be experienced by professionals when engaging with their male colleagues, resulting in a depreciation of confidence and a lack of acceptance. Social identity threat is defined by Steele, Spencer and Aronson (2002), as the concern that individuals experience in situations which their social group is deemed inferior or unrepresented. Taking this into consideration, the female engineers may be experiencing stereotype threat as a result of their minority status in the engineering environment.

Faulkner (2009) notes that young male engineers also need to establish their professional credentials as a junior engineer. Therefore, a few of the participants narrated that they had to prove themselves more than their counterparts as an engineer, however, many of the participants narrated that they did not need to prove their competency as an engineer, but rather a junior engineer. Bastalich et al. (2007) noted in their study of female engineers that many of the younger women reported incidents of the 'aggressive' and 'competitive' behaviour of the male engineers and reported incidents of being ignored, offended and not listened to. Therefore, it may be that junior engineers experience such incidents based on their 'years of work' and not their gender.

A few of the participants that had experienced challenges or the 'subtle issues' as noted in the previous discussion, noting that this was not done intentionally, as males were 'good people' on a personal level. However, there are various professional issues that do arise, in which a few of the participants note that this may be due to the males also adapting to female's presence in the engineering environment.

4.5 Conclusion

The nature of the identities in which the participants narrate can be seen as an act of intersection of the various identities, in which the participants acknowledged in their narratives. The various identities are viewed as manifestations that form from the social interactions in which the participants immerse themselves. During the study, an interesting theme emerged as many of the participants would acknowledge the ‘subtle issues’ that emerge during their experience, however, stated that these did not cause major implications for themselves or affect their career satisfaction. Furthermore, it has been noted that as a female engineer, many of the women need to adopt characteristics and behaviours which are masculinised, in order to create a sense of belonging with the culture of the organisation. This is due to the culture of the organisation being shaped by the dominant group, which consists of the male gender, therefore, it is required of the minority group (the females), to succumb to the behaviours that has been appropriated by the males. Participants that engage with the role expectations that have been prescribed by the males, is an example of how women internalise the appropriated behaviour, therefore, women adapt to the culture of the organisation, or challenge the status quo (Hooks, 1989). As women adopt masculinised behaviour and characteristics, this can be viewed as, women ‘doing gender’ as noted by West and Zimmerman (1987). Furthermore, many of the participants noted their experiences as a female engineer to be positive, as well as negated the role of their race in the experiences. However, a few of the participants narrated the tensions that are formed based on the intersection between their race and gender, as well as the implications of the tensions on their experiences as a female engineer. Lastly, as women have entered into a male dominated profession which is largely associated with male characteristics and behaviours, this can be viewed as women resisting the socially defined roles, which may be perceived as a form of agency that women adopt to challenge the defined roles which society has prescribed for men and women (Caldwell, 2007).

Chapter Five

Conclusion, Recommendations and Limitations

This chapter provides a summary of the findings from the study, as well as offers recommendations for further research and interventions that could be utilised in the field of engineering. Lastly, the chapter converses the limitations of the study.

5.1 Summary of the findings

The objective of this study was to provide female engineers' narratives of the experiences in the field of engineering, pertaining to the intersection of the female engineers' race and gender. Drawing from the theoretical frameworks of Social Constructionism and Intersectionality, the study aimed to investigate four broad research questions: 1) how female engineers narrate their experiences of the engineering field; 2) the challenges that women experienced in a workplace that is male dominated; 3) how does gender and race shape the experiences of female engineers and lastly, 4) the implications of these experiences on the women's well-being and personal, relational, cultural and social identities. Due to the overlapping theoretical frameworks, a thematic analysis was the appropriate method to use to analyse the data, due to the flexibility to analyse qualitative data.

The central concepts of race and gender, which are embedded in Social Constructionism and Intersectionality were investigated in the study. Through Intersectionality, the study investigated how the female engineers narrated their experiences as female engineer of a specific racial group, as these identities intertwine. In addition, Social Constructionism was utilised to examine how the women narrated their experiences, using their own perceptions and a relativist perspective.

From a holistic outlook, the narratives of the participants formed various tensions, as their intersecting roles and identities were investigated. These identities were not viewed in isolation, but rather as fluid and dynamic, which inform each other to shape their experiences. Furthermore, many of the participants, (although they did not acknowledge the intersection), narrated the interceptions of the identities outside of their occupational identity, which shaped and informed their experiences as a female engineer. Thus, the study investigates the various elements of the women's identities and the interceptions thereof.

Three fundamental themes emerged from the study, which included: 1) *Negotiating the intersection of multiple identities*; 2) *Mediating the Two Extremes* and 3) *Proving Yourself*. Within the themes, tensions emerged as the women negated the differential treatment between the men and women, however, noted aspects that formed differences between the men and women.

The subsequent discussion summarises the findings that were investigated in the study, including the themes and the subthemes thereof.

5.2. Negotiating the intersection of multiple identities

The identities that the females possess are varied, however, operate simultaneously. As the female engineers are professionals, this informs their professional identity. However, women also possess a personal identity outside of the engineering workplace, which commonly constitute feminine characteristics (Jorgenson, 2002). Women also engage in social and relational identities apart from their professional identity, these include the social relationships that the women engage in.

5.2.1 Personal and Professional Identity

Participants acknowledged the role of their professional identity informing their personal identity in the engineering environment, as many of participants noted the characteristics and behaviours in which they need to adopt in order to conform the culture of the organisation. Faulkner (2009) asserts that the largest group in the organisation will inform the culture of the organisation, therefore, the minority group (females) will need to adapt to the environment in order to be included. Many of the participants noted having to adopt characteristics which is strongly associated with 'masculine' characteristics, therefore, the women needed to restrain their feminine characteristics, such as being emotional in order to 'fit in' with the culture. Furthermore, these behaviours are appropriated in the engineering environment and are therefore perceived as 'normative.' As these behaviours are appropriated in the workplace, these traits and behaviours inform their personal identity. Therefore, it can be noted that the women's professional identity shaped the women's personal identity. However, this is context dependent, as appropriated behaviour in the engineering workplace may not be appropriate for females outside of the workplace and vice versa (Bastalich et al., 2007). However, it has been asserted in the literature that if women do not conform to the masculine norms of engineering, they are considered an, 'outsider' and 'foreign,' explaining why the women adopt these characteristics, in order to prevent subjugation (Ibid, 2007).

5.2.2. Social, Relational and Professional Identity

Many of the participants negated the influence of their professional identity on their social identity. Therefore, the stereotype pertaining to the social life of engineers was not perceived to be accurate in the participants' narratives. The impact of one's professional identity as an engineer did not create as much of an impact as expected. However, this may be dependent on the engineering industry, as the maintenance and manufacturing environment was narrated to

be more demanding. Thus, as many of the participants were involved in the design industry, the impact was annulled in the women's social identity, as many narrated that the organisation was understanding to the various roles in which women engaged in. In addition, many of the women reported the role of their social identity in their professional identity, as the relationships that were formed outside of the workplace informed their professional identity.

Furthermore, the women narrated the role of their professional identity impacting their relational identity, as the 'intimidation factor' was formed between the women and the men pertaining to their dating life. The intimidation factor is prevalent in Palermo's (2004) study, as she asserts that men may become intimidated of powerful women. Therefore, as women are professional engineers and demonstrate independence, this may be illustrated as women challenging the notion of 'hegemonic masculinity' (Connell, 2005). Lastly, many of the participants noted that being a professional engineer allows for the women to perform the role of a role model. Additionally, the females narrated the importance of a role model in the engineering industry, especially being a female, as the women are able to share similarities with the younger female engineers. Consequently, they were able to form mentoring networks, consequently enhancing the persistence in the field of engineering. Gibson and Espino (2016) assert the importance of role models for Black engineering students, which was prevalent in the current study, as many of the Black African, Indian and Coloured participants would state that they are represented as a role model.

5.2.3 Deconstructing Race and Gender in the Field of Engineering

Ambivalence was narrated in the female engineers' narratives pertaining to the female's gender and race, as many of the women negated the role of their race in the experiences as a female engineer. However, a few women acknowledged the role of their race as a female engineer and

therefore, noted the intersection between one's race and gender, forming complexities in one's experience (Crenshaw, 1989). The women that narrated such complexities generally experienced the 'glass ceiling' due to the lack of commonalities between the women and the males, which was further amplified due to the racial and language barrier that was formed between the two (Baxter & Wright, 2000). However, once the barrier had been removed, the women noted the ease of forming relationships with their seniors. In addition, many of the women reported the role of the Broad-Based Black Economic Empowerment Act in the advancement of their careers as an engineer.

5.2.4. The Role of Motherhood

Only one of the participants performed the dual role of being a mother and a professional, however, the dual role was perceived as challenging, as one would have to balance the demanding engineering field, as well as the demands of motherhood. The participant notes that any working mother experiences such challenges, however, may be more challenging due to the demanding industry. Furthermore, an incongruence was formed between being a mother and an employee, as ambivalent emotions were experienced pertaining to the needs of one's children. However, the participant notes the role of the company in the accommodation of balancing the role of motherhood and an employee, as well as the importance of a support system. Furthermore, in contradiction to the literature (Ayre et al., 2013; Faulkner, 2009; Jorgenson, 2002; Watts, 2009), the participant has not felt discrimination when attempting to balance the role of motherhood and an engineer. However, two of the other participants who had not entered motherhood proclaimed the complexities and challenges that women face when balancing both roles, as noted in the literature (Ayre et al., 2013; Watts, 2009).

5.2.5. Implications of the Field of Engineering

Many of the participants have narrated positive experiences as the female engineers and had not experienced much discrimination in the field of engineering. However, the women that did experience challenges formed a positive stance thereof in which enabled them to perform at a higher standard as an engineer. This was prevalent in Bastalich et al's (2007) study, as when tested, the females would become more determined. However, a few women did narrate the hardships of the challenges in the engineering industry on their emotional well-being. In addition, many of the women narrated their persistence in the field of engineering, with the exception of a few who narrated the negative effect of the challenges on their persistence. Ayre et al's (2013) study affirms the positive experiences that the authors participants had, (despite the 'subtle issues') which was congruent with the current study. Therefore, increasing their persistence in field of engineering.

5.3 Mediating the Two Extremes

An incongruence was formed in the subthemes of 'standing out as a female' and 'one of the boys,' as the participants narrate a divide between the men and women in the engineering industry, however, denote the relevance of the divide on their experiences as a female engineer. The women noted the differential treatment which occurs between the men and women, however, this was not perceived as challenges to the researcher and the participants, but rather 'subtle issues.' However, by narrating such differential treatment a divide is formed, emphasising the discrimination. In addition, the divide was not perceived as discriminatory to the majority of the female engineers. These issues were prevalent in the engineering environment, however, did not impede on the women's career satisfaction or their persistence, which was noted in the literature (Ayre et al., 2013; Bastalich et al., 2007).

Furthermore, many of the women were treated as ‘equals’ and ‘one of the boys’ to the extent that the males would perform masculinised behaviour in the presence of the females. This was justified by the participants, as they would assert that the behaviour is not intentional, but rather due to the lack of female presence in the industry. Consequently, as the women do not acknowledge the differential treatment, changes cannot be made in the industry to rectify such differential treatment, regardless of the behaviour being ‘subtle.’ Contradictory to this, is that many of the participants assert that the company’s policies prevent discrimination and a divide relating to race and gender, however, women still note issues that form such a divide.

5.4. Proving Yourself

Contradictory narratives were reflected in relation to proving oneself as a female engineer or proving oneself as an engineer. The narratives noted that a few women felt the need to prove themselves as a female engineer, whilst the other few noted the need to prove themselves as an engineer. A few of the women that needed to prove themselves as a female engineer noted the intersection of their race and gender in their experiences as a female engineer, which was illustrated in Gibson and Espino’s (2016) study, in which the authors acknowledge the intersection of race and gender in the experiences of female engineering student, consequently resulting in the women experiencing additional complexities. Other participants noted the effect of age and experience relating to the competency of an engineer. Furthermore, these women noted that the non-existent role of their gender when being judged as a competent engineer. Faulkner (2009) acknowledges the importance of establishing one’s credentials as an engineer, regardless of gender, which was evident in the narratives. Therefore, conflicting narratives are formed between the participants. Moreover, the acknowledgement of experience as an engineer was reflected in many of the participants narratives. Interestingly, the participants also noted the preconceived barrier that is formed for female engineers, as women

enter into the industry with preconceived biases and judgements, which may affect their experiences as needing to prove themselves as a female engineer, however, may not be existent.

5.5. Recommendations:

Due to the masculine culture that is inherent in the field of engineering, business processes and practices have been adapted in order to accommodate such culture. As a result, there is an absence of values that are likened with femininity, preventing women from thriving in such industries. Therefore, it is recommended for engineering organisations to take an objective stance on the organisation and to develop and implement processes which include feminine and masculine characteristics. Hence, engineering organisations need to develop strategies that will accommodate and retain females in such an environment. This can only be implemented if organisations view their processes and procedures objectively and understand the adverse impact such an environment can have on the retention of females. However, the major concern as highlighted in the current research is that female engineers are not acknowledging the toxic environment and labelling such as ‘subtle issues.’ Therefore, organisations need to be made aware of these issues, despite the subtleness of the concern. If female engineers do not raise these concerns, organisations will not be able to advance, as females are attempting to adapt to the environment, as noted in the current study.

A few of the participants acknowledged the importance of a support system in the organisation, which will allow for the females to reflect on issues in the organisation and provide support to such issues. This will also allow for concerns to be raised in the organisation, therefore, improvements can be made to encourage females to enter the engineering environment, as well as retain female engineers. Additionally, a mentoring network will be advantageous in a male dominated environment, as this will allow for women to express their opinions, especially for

graduate engineers, as this encourage graduate engineers to remain in the industry, due to the mentee-mentor relationship. The mentor-mentee relationship will allow for senior engineers to become a role model for the junior engineers, which will encourage junior engineers to express their concerns and provide solutions to such concerns.

5.6. Limitations and Recommendations for Future Research

As the study incorporated a small sample size and relied on snowball sampling, the study cannot be generalised to all female engineers. However, significant results did manifest from the narratives which women provided, which can be taken into account. As there is a lack of South African studies on women in the field of engineering, future studies can be conducted to confirm or contradict the research the findings of the study. Furthermore, future studies can provide a comprehensive understanding of female engineers. Additionally, follow-up interviews were not conducted, due to time constraints. Reliability of the researcher's interpretation of the narrative may have been enhanced, had the women verified the data analysis for accuracy. Furthermore, a further limitation is that the researcher was a novice to the interview process. In addition, as the study aimed to uncover race and gender, as the researcher is a 23-year old white female, this may have implications on the women narrated their experiences pertaining to a sensitive issue in South Africa. The researcher was substantially younger than the majority of the participants, which may have affected the narrations of the engineers, as well as the researcher having minimal understanding on the field of engineering.

It is recommended that future studies investigate men and women in the study, in order to obtain a holistic perspective of the field of engineering pertaining to gender and subsequently, the power dynamics which are formed due to the 'masculine' behaviours that are appropriated

in the field of engineering. A cross-sectional analysis will allow for information to be obtained from more participants which will inform holistic interventions.

5.7. Researchers Reflection

As the research emerged, I became more and more enmeshed in the participants narratives, especially as contradictions arose from the existing literature. Initially, I was perplexed by the narratives that I was provided with, however, more and more of the participants had similar stories to tell, with the exception of one or two twists, which allowed me to engage even further in the narratives. These narratives puzzled me the most in terms of race and gender and how the participants would explain their understanding of the intersection of race and gender in their reality. Hence, the dynamics pertaining to race and gender was very interesting in relation to the current study. When analysing the existing literature, diverse information emerged which was not always evident in the narratives of the participants – which was interesting, as contradictions emerged between the existing literature and the participants narratives. The research has played a role on my experience as an aspiring Industrial Psychologist, as race remains a sensitive topic in South Africa, yet the results that emerged from the narratives demonstrated some form of positive development. However, this was not generalised across all racial groups, therefore, there are still factors that need to be critiqued in the workplace, for further development especially in male dominated industries, such as Engineering. It was interesting to note how South Africa has developed in terms of racial dynamics for some of the participants. However, double marginalisation is still pertinent in contemporary organisations as shown in the existing literature, as well as is evident in daily realities, therefore, these can be acknowledged as a developmental area for organisations in order to provide an equal work environment for both men and women. If organisations develop on such an area, this will allow

for the retention of females in not only male-dominated industries, but all industries, as a safe working space will be provided free of discrimination.

5.8. Conclusion

In summary, the data that emerged from the participants narratives was diverse and rich and when contrasted to the existing literature. The overarching themes that emerged from the data include 1) Negotiating the intersection of multiple identities, 2) Mediating the Two Extremes and, 3) Proving Yourself. Interesting results yielded from the study when compared to the existing literature, these were discussed in relation to the literature, providing a critical analysis of the data compared to the existing literature. Recommendations for organisations have also been provided based on the data that emerged from the participants narratives. Limitations and recommendations for future research have also been provided. Lastly, a researcher's reflection is provided based on the experience that the researcher had throughout the research process.

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Appendices:

Appendix A

Interview Schedule

- 1) Please tell me more about yourself (probe: marital status, children, age, gender, race).
- 2) Which field of engineering did you decide to pursue? (why)
- 3) How long have you been an engineer?
- 4) What positive experiences have you had as an engineer?
- 5) In your overall experience as an engineer, would you consider the engineering field to be male-dominated?
- 6) How has this affected your experiences as an engineer?
- 7) Were you easily accepted in the workplace culture?
- 8) Have you experienced the acceptance to be more challenging or easier due to your race?
- 9) What other roles do you play in society (mother, wife, girlfriend etc.)
- 10) How do the various roles that you play in society impact the way the other engineers and employees view you at the workplace?
- 11) Have you experienced challenges regarding the different roles you play as a woman (mother, girlfriend, wife)?
- 12) If so, what challenges? (probe: maternity leave, part-time work, family responsibilities etc.)?
- 13) How does this affect you as an individual?
- 14) How have you experienced the engineering workplace as a black/Indian/coloured/white female? (positive and negative)
- 15) Have you experienced the engineering field to be more challenging due to being a black/Indian/white/coloured woman in the engineering workplace?

- 16) What are the effects of these challenges to you as a woman? (Probe: your social role, your identity as a woman, your well-being)
- 17) How is your well-being affected by these challenges (anxiety, depression, demotivated etc.)?
- 18) How do you overcome these challenges in the workplace?

Appendix B

Ethical Clearance



12 May 2017

Ms Tarryn A Goose 213518928
School of Applied Human Sciences
Howard College Campus

Dear Ms Goose

Protocol reference number: HSS/0395/017M

Project title: Uncovering the Intersection between race and gender of the experiences of female engineers.

Expedited Approval

In response to your application dated 24 April 2017, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted FULL APPROVAL.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully


Dr Shenuka Singh (Chair)

/ps

cc Supervisor: Sheldia Bobat
cc Academic Leader Research: Dr Jean Steyn
cc School Administrator: Ms Ayanda Ntuli

Humanities & Social Sciences Research Ethics Committee

Dr Shenuka Singh (Chair)

Westville Campus, Govan Mbeki Building

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Telephone: +27 (0) 31 266 3587/3580/4557 Facsimile: +27 (0) 31 266 4809 Email: shenuka@ukzn.ac.za / joan.steyn@ukzn.ac.za / mbobad@ukzn.ac.za

Website: www.ukzn.ac.za

Appendix C

Information sheet and consent to participate

Master of Social Science Industrial Psychology Research Dissertation

Tarryn Goose (Student No: 213 518 928)

Information Sheet and Consent to Participate in Research

Uncovering the intersection between race and gender of the experiences of female engineers

Date: May 2017

To whom it may concern,

My name is Tarryn Goose. I am a Master of Social Science (Industrial Psychology) student from the Humanities department of the University of KwaZulu-Natal. My contact details include: Cell No. 076 060 3172; e-mail address: tarryn77@live.co.za You are being invited to consider participating in a study that involves research on the experiences of female engineers; more specifically how race and gender intersect to shape the experiences of female engineers and the aim of the study is to understand and uncover the impact thereof. The study is expected to enroll 11 participants (3 white females; 3 black females; 3 Indian females and 2 coloured females), 4 engineering sites, as well as variety of engineering disciplines, these include mechanical, civil, chemical and industrial engineers in Durban, KwaZulu-Natal.

The duration of your participation if you choose to enrol and remain in the study is expected to be approximately an hour to an hour and a half. The study may involve the discomforts of disclosing personal experiences as a female engineer. This the study is aimed at uncovering the challenges and experiences of female engineers and how their racial group informs and shapes these experiences, it may be beneficial for the research conducted to develop possible interventions that will encourage and promote female engineering students and potential female

engineers to pursue the field of engineering. This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (HSS/0395/017M).

In the event of any problems or concerns/questions you may contact the researcher at 076 060 3172 or tarryn77@live.co.za or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus Govan Mbeki Building Private Bag X 54001
Durban 4000 KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609 Email: HSSREC@ukzn.ac.za

Participation is voluntary and participants may withdraw at any point, in the event of withdrawal/refusal of participation the participant will not incur penalty or loss. The participant will not suffer any negative consequences in the event of withdrawal/refusal to participate. The participant may notify the researcher at any point in time, should they want to withdraw. Confidentiality will be maintained at all times. The information from the interviews will be stored electronically and will be kept safe. The information will also be stored in the Psychology Department. The interview transcripts and recordings will only be reviewed by the researcher and the supervisor. Pseudonyms will also be used in order to maintain confidentiality in the final dissertation.

Appendix D

Informed Consent

Informed Consent:

I _____ have been informed about the study entitled of how race and gender intersect to shape the experiences of female engineers by Tarryn Goose. I understand the purpose and procedures of the study which is to uncover how race and gender intersect in the experiences of female engineers.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to. If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at tarryn77@live.co.za or 076 060 3172.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus, Govan Mbeki Building

Private Bag X 54001, Durban 4000, KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557 - Fax: 27 31 2604609 - Email: HSSREC@ukzn.ac.za

I hereby provide consent to:

Audio-record my interview / focus group discussion YES / NO

Video-record my interview / focus group discussion YES / NO

Use of my photographs for research purposes YES / NO

Signature of Participant

Date

Signature of Witness

(Where applicable)

Signature of Translator

(Where applicable)

Date